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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW
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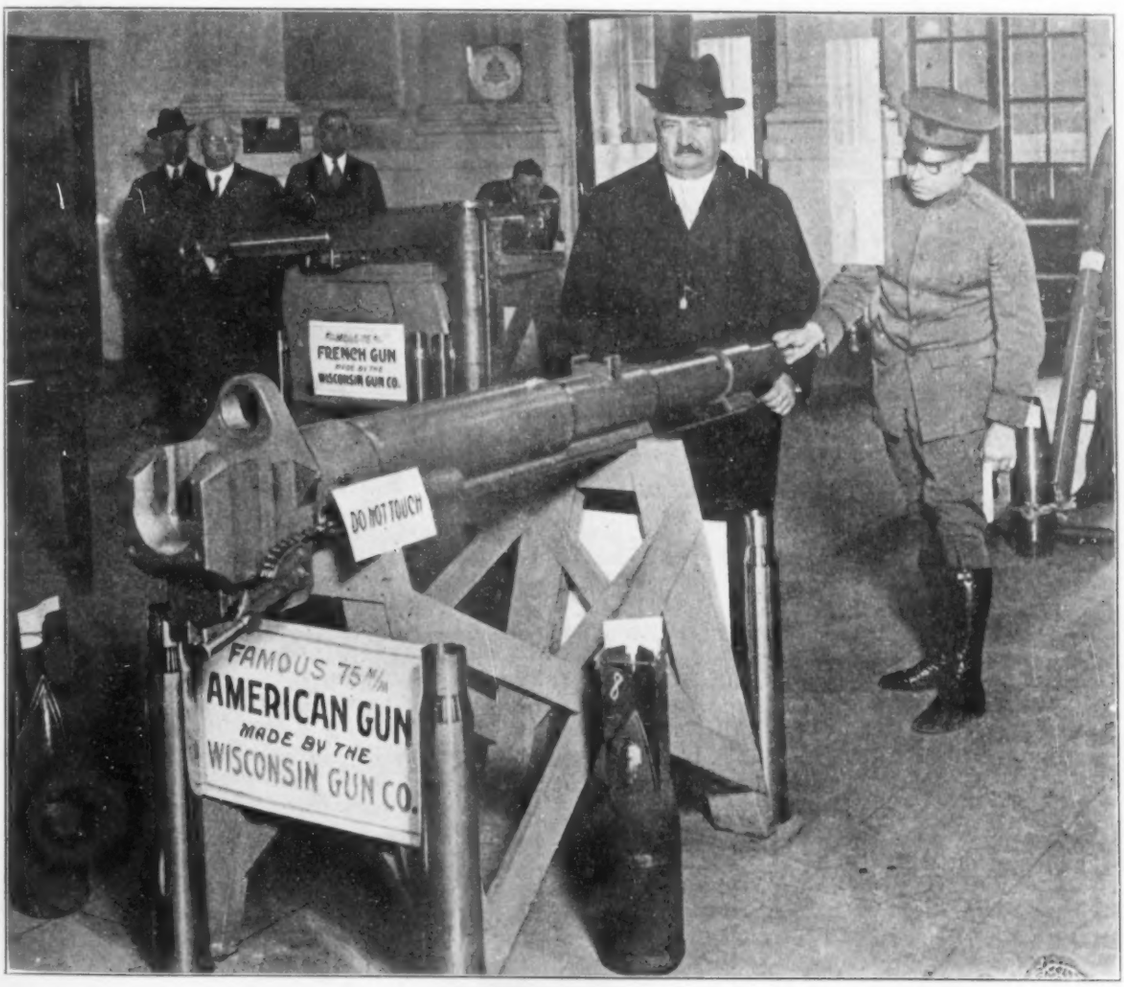
THE GATING OF METAL CASTINGS

AN INTERESTING ARTICLE IN WHICH IS TOLD THE ONE BEST WAY TO GET CLEAN CASTINGS.

WRITTEN FOR THE METAL INDUSTRY BY R. V. HUTCHINSON.*

In the foundry of to-day there is probably nothing so much neglected and known so little of as the science of gating. For a science it is, and many foundrymen here and there are realizing this fact more and more as time goes on. The average man thinks only of keeping his runner gates and his branch gates small, knowing, of course, that every additional pound of metal poured into a gate rapidly runs up his cost on the castings he produces.



MANGANESE BRONZE CASTING FOR 75 MM. GUN SHOWN AT FOUNDRYMEN'S CONVENTION HELD AT MILWAUKEE, WIS., OCTOBER 7-11, 1918. GOVERNOR PHILIP OF WISCONSIN IS "STANDING BY."

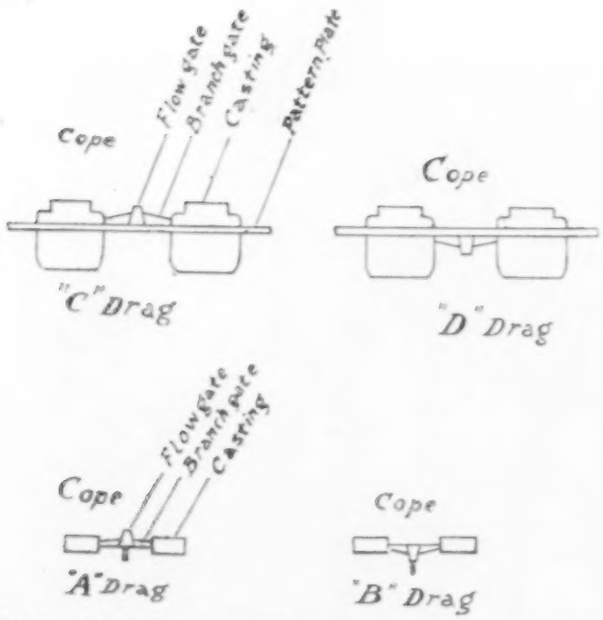
Some men carry this too far. Their gates are too small, their runners are not large enough to float the oxides common in all metals, and pieces of charcoal and dirt that very often get by even the most careful

*Foundries superintendent, Sterling Sales Company, Auburn, Ind.

skimmers. Then, again, their branch gates are too small, and an otherwise perfect casting will show a draw, sometimes at the gate and sometimes within the casting itself. This type of "penny wise and pound foolish man" is a common one. He scraps from 15 to 25 per cent of his castings when his loss should be 5 per cent at the most, and when he considers the unusually high cost of molding and melting and overhead at the present time, he has anything but a pleasant fact confronting him.

Then we have foundrymen who make their gates much larger than necessary, and others who do not discriminate, placing big gates on small castings and small gates on large castings.

But by far the greater number of offenders are to be found in the men who use a great plenty of gate but do not use it to the best advantage. I speak of the foundrymen and patternmakers who insist on putting runner gates in the drag instead of in the cope and do it for the only reason that men before them did it that way. It takes only a very brief investigation to be convinced that such gating is absolutely wrong.



RIGHT AND WRONG POSITIONS FOR "GATES." A AND C ARE CORRECT, WHILE B AND D ARE INCORRECT.

If a runner gate shows the presence of any oxide, dirt, or charcoal where will it be found? Nine-tenths of it will be found on the top or well toward the top. The oxides and charcoal being of less specific gravity than the metal, will float on top, of course. Putting the runner in the drag makes the top of the flow gate flush with the top of the branch gates and consequently any oxide or charcoal floating there will be washed right into the castings. On the other hand when the runner is placed in the cope, the dirt is floated above the branch gates, and in this way is kept out of the castings. The following sketches will illustrate this point better than words. "A" shows the proper position for the runner in relation to the branch gates and to the patterns, and "B" the incorrect relation. Likewise "C" is correct and "D" wrong.

Another fault that many men have is stopping their flow gate at the last branch gate. This error cannot cause anywhere near the trouble that a runner in the drag will, but nevertheless it is a thing well worth correcting. The flow gate should extend some distance beyond the last branch gate, this distance depending somewhat on the nature of the work and the length of the runner. On ordinary bench work where a man uses a 20 or 24-inch flask, a ¾-inch addition should be plenty. Before a man pouring gets his sprue-head full, a certain amount of dirt is bound to get into the gate, and this small extension acts as a pocket for this oxide and dirt and helps materially in keeping the castings at the foot of the runner free from them.

SPRUES PLAY AN IMPORTANT PART.

But proper gating will not give us clean castings unless other things are understood and followed out. The sprue, for instance. The sprue means considerably more than a mere hole in the sand, and care should be used in selecting different sizes for different jobs. Many cases can be sighted where the gating was proper and the pouring and skimming good, and still the results very poor, and this found due to improper selection of the sprue cutter. Ordinarily speaking, the area of the sprue should be larger than that of the runner so that the proper pressure can be put on the latter, and the flow gate in turn should have a larger area than the branch gates feeding the respective castings, in order that the proper pressure is exerted there also. In other words, if the sprue is smaller than the runner, it is impossible to keep the latter full, and if clean castings are to be had the runner must be kept full so that the dirt can be floated. But even though the sprue and the flow gate are properly proportioned, dirty castings can result from the wrong relation of the runner to the branch gates. The area of the runner in turn should be larger than the area of the gates feeding the respective castings. In other words, the branch gates must not take the metal faster than the flow gate can give it. If these proportions are observed and the man pouring gets a good start and keeps his sprue hole full, floating considerable dirt there, and the skimmer does his work right, cleaner castings will be the result. This means also that men afraid of scrap on account of the dirt it contains, can use considerable of it without danger. One more word about the sprue. Better results are obtained as a rule by cutting it on a slight angle, tapering toward the flow gate. With nickel-silver this is absolutely essential for good results. Speaking further on skimming, some brass men use a hardwood block that fits freely in the ladle. The dirt should be pushed back with an iron skimmer and the block pushed over the lip of the ladle, forcing the dirt and charcoal to the back and holding it there until pouring is finished. This block has another function; it not only is the best skimmer a man can get, but while burning on the top of the pot it throws off enough smoke to keep the metal from being attacked by the atmosphere. It is surprising how much oxide is formed in the process of pouring when the metal is very much exposed.

OTHER CONSIDERATIONS.

What has been discussed so far about gating has been in connection with its help in keeping castings clean. But there is another angle just as important to be studied. There is an old saying still quoted by many foundrymen, and that is that any gate that will run a casting is plenty large enough. In many cases this is true, but in many other cases it is entirely wrong. A branch gate must not only be large enough to fill a casting, but to feed it when it shrinks and calls for metal. The skim gate is a gate to be used but not misused. Clean metal is one thing to be considered and miss runs and draws another. A man can lose considerable money either way. The iron men should have little trouble with draws and shrinks. The brass man has considerably more and the

nickel-silver and aluminum casters probably most of all. It is impossible to lay out a set rule on branch setting, as each type of pattern has its own peculiarities, and the gating depends not only on its shape and size, but on the kind of metal to be poured into it. To make a casting of nickel-silver it may be correct to gate in the same place one would making this casting of a brass or bronze, but the gate would have to be larger or a draw would be the result, on account of the greater shrinkage of the former.

But there are some castings that cannot be corrected even by the best of gating. Many designers forget the foundryman and his troubles, and castings often have to be made from patterns out of all reasonable proportions. Many times these faults cannot be corrected by gating, and it becomes necessary to use other ways. For instance, a heavy spot runs into a light spot at an inconvenient place and must be fed through it. The light spot sets while the heavy is still liquid, and when the latter calls for metal it cannot get it and the result is a draw condition, and many times a crack clear through the casting. Sometimes similar difficulties are cured by chilling, sometimes by risers and off-shoots. But in many instances chills and risers slow up production to such an extent that using them is not practical. Then again patterns are sometimes designed so that either is an impossibility. Oftentimes a small fillet tapering off the sharp angles gives wonderful results. A good example can be sighted in a disc-shaped casting having a heavy hub, and an outer flange connected with the hub by spokes. In shrinking, over 60 per cent of the castings cracked where the spokes ran into the hub. A fillet at that point nicely tapered off did what neither gating nor chilling could do.

There are many other things a foundryman has to consider, of course. But nothing is more important than the condition of his sand. Dry sand causes washes. Wet sand and sand rammed too hard will cause kick-offs and air pockets. Often the foundryman who has porous castings blames his metal, when the trouble is in the mold. Venting is another thing to watch, and so it goes.

But if one makes up his mind to get his foundry loss down to 5 per cent he can do so, and the place to start is on the pattern plate. Get your gates right first, for no matter how careful you may be in other ways, first-class results cannot be obtained if your gating is wrong.

SOLDERING OF ZINC

SOME VALUABLE HINTS ON AN IMPORTANT SUBJECT. WRITTEN FOR THE METAL INDUSTRY BY E. V. PETERS*

So many demands are being made on zinc these days for replacing other non-ferrous metals, the supply of which is limited, that it is interesting to learn with what facility soldering operations in connection with the use of rolled zinc may be accomplished. The process is, in fact, a simple one that entails no more labor than is required for the soldering of tin.

While it may not be generally recognized that sheet zinc, now so generally used as a material for commercial work, is one of the easiest metals to solder, this fact is nevertheless true. Experiments have shown it to be particularly susceptible for soldering and, indeed, some experts claim sheet zinc is even more conducive to this operation than are other sheet metals.

Like anything else, however, to obtain good results it is necessary that the operator be familiar with his work. Most failures in the attempt to secure joints of the desired strength and quality where sheet zinc is concerned, are due to overheating the metal. In many cases too long an application of the soldering iron is responsible for unsatisfactory results. As in similar operations on tin, other details must contribute to obtaining the highest efficiency in the work, but these can be easily mastered by any workman who is familiar with the general operation.

Only a quick pass of the soldering iron over the metal is needed to produce a very stable joint. Otherwise, the zinc is either melted or its internal structure becomes changed by the overheating, with a resultant weakening of the metal, a condition that frequently produces this complaint.

Quite important it is to know that sheet zinc melts at a temperature of 419 degrees Centigrade, or 786 degrees Fahrenheit. It is usual to heat the soldering iron until it becomes a dull red, at from 500 to 550 degrees Centigrade, or its equivalent of 932 to 1,022 degrees Fahrenheit. This is sufficient to perform the soldering of joints when sheet zinc is used by the quick application above referred to, as opposed to allowing the iron to remain for a longer time on the surface of the metal.

It is customary to use half and half solder and with its intelligent application excellent work can be accomplished. Preceding the actual operation, however, a "cut acid" fluxing solution, or a solution of zinc chloride acidulated with muriatic acid, should be applied to the metal being prepared for the work.

As is true of other metals, care should be observed to insure the sheet zinc being first free from dirt or grease, particularly along the line to be soldered, and the customary caution should be taken in seeing that the seam surfaces are in perfect contact. These details are essential in the successful soldering of any metal whether it happens to be zinc, or tin, or possibly other materials of the non-ferrous field.

Contrary to the prevalent idea among some metal workers, the successful soldering of zinc is one that need neither be feared nor shunned because of the supposition that the work is hard to accomplish. By observing the above details the operation is simple and necessitates the use of very little solder.

Modern automatic machinery has been installed in various plants where a large number of zinc articles are made. These have lessened to a marked degree, the difficulties that were once thought to beset those who derive their livelihood from working this metal, but the hand method gives equally satisfactory results when employed by experienced workmen.

*Assistant general sales manager, New Jersey Zinc Company.

CASTING ALUMINUM BRASS.

Assuming that the alloy used is free from iron and that it is carefully melted, it is most likely that the cause of the drossy castings is improper gating. Aluminum-brass castings should be gated as for manganese bronze. The runner gates should be of the letter "S" or similar shape that is capable of holding back the dross and finger gates should be used as inlet gates. After pouring has started the down gates should be kept full to prevent any dross from entering the mold.

Instead of using aluminum in the mixture one might try the new deoxidizer, aluminum-uranium. Uranium is one of the most powerful deoxidizers known and is worthy of a thorough trial by brass founders who are users of aluminum in their brass or bronze mixtures.—J. L. J.

MILITARY APPLICATIONS OF ELECTROPLATING

A Paper Presented at the Meeting of the American Electrochemical Society, Atlantic City, Sept. 30-Oct. 2, 1918.

By William Blum—Bureau of Standards, Washington, D. C.

In the past, electroplating has been considered chiefly as an art, both with respect to its methods of operation and to its extended use for decorative purposes. Only within recent years has the importance and usefulness of electroplating as a protection against corrosion received serious consideration. In general, the application and relative value of rust protective coatings has received all too little thought from manufacturers, who have frequently given greater consideration to appearance than to lasting qualities. This condition, together with the necessity of deciding first upon questions of design and materials of construction to be used on military supplies, accounts for the slight consideration given by military officials in the early part of the war to the subject of protective coatings, including electroplating.

More recently, however, the subject has assumed increased importance, and numerous questions upon metal finish are arising, the correct solution of which may at times be very important and urgent. In general, the necessity of adapting the finish to the use or exposure of the particular parts, is now recognized. In this connection, the following tentative classification of protective coatings has been suggested by the Bureau of Standards. While not formally adopted by the military departments, it has in several cases served as a guide in the specification and inspection of finishes.

SUGGESTED CLASSIFICATION OF PROTECTIVE COATINGS ON METAL PARTS OF MILITARY SUPPLIES.

I. For steel or brass which requires protection only during storage or transportation.

Examples. Parts of hand and rifle grenades, stoves, etc.

Finish. Grease, slushing oil, or similar compounds.

Requirements. Suitable consistency to insure complete covering and proper adherence, and freedom from acid or other constituents that will stain or corrode the metal.

II. For steel or brass for indoor use, or for mild exposure, or which does not require handling except during the process of manufacture or assembly, or which can be frequently cleaned and oiled.

Examples. Trench implements, shell bodies, scabbard parts, rifle parts, revolver parts, saddlery hardware, etc.

Finish. Any protective coating that will produce the desired color, appearance and resistance to abrasion. Subject to these limitations, the following finishes may be employed:

(a) Electroplated deposits. Nickel, black nickel, copper, brass, zinc and silver.

(b) Chemically Applied Finishes. Oxide finish, such as Nauerbarff, Bontempi, Bradley, Carbonia, Anchorite, sodium nitrate dip, blueing, browning; copper oxide by the copper nitrate process; phosphate finishes, such as the Parker Process.

(c) Mechanically Applied Coatings. Paint, lacquer, enamel, etc.

Requirements. For this class of material it does not appear practicable to apply any corrosion or service test, other than use under service conditions. The degree of protection required, or that afforded by most of these processes is not sufficient to be measured even approximately by such a test as the salt spray test. It is therefore suggested that visual inspection for completeness and uniformity of coating be the basis of acceptance.

III. For steel subject to moderate outdoor exposure, or which it is desired to salvage.

Examples. Belt fittings, magazines, cartridge clips, boosters, adapters, fuse parts.

Finish. Zinc plating should be given preference. When a black finish is required, zinc plating may be followed by a suitable black finish, e.g., black nickel plating; chemical finishes such as Anchorite; or mechanical finishes such as black enamel, lacquer or japan.

Certain of the finishes listed under II may meet the requirements, e.g., the iron oxide or phosphate finishes.

Requirements. If any fair degree of protection against corrosion is desired, the articles should be required to withstand a 24-hour salt spray test. In certain cases the 24-hour moist atmosphere test may be sufficient, though such a test is not rigid or strictly reliable.

IV. For steel exposed to severe outdoor or marine conditions.

Examples. Hardware on ammunition boxes, steel cartridge cases, tent equipment, field office equipment, etc.

Finish. Zinc coatings only should be employed. They may be applied by hot dipping, sherardizing or zinc plating.

Requirements. Such parts should be required to withstand at least 48 hours salt spray test, and in extreme cases, 72 hours or more.

V. For steel requiring special protection against acids or other corrosive liquids.

Examples. Parts of gas shells, chemical apparatus, etc.

Finish. Lead plating.

Requirements. A minimum average thickness of lead, and freedom from porosity.

VI. For metal to be used in contact with foods.

Examples. Table ware, cooking utensils, waterpails, emergency ration cans, etc.

Finish. Nickel or silver plating, tinning, or silicate enamels.

Requirements. The metal coatings should have a certain minimum thickness or weight of metal and be uniform and continuous. Enamel coatings should be required to withstand suitable heating and mechanical tests for chipping, and tests for solubility, and be free from poisonous constituents.

General. In general it is not believed to be practicable or desirable to specify the exact conditions of operation in the application of metal finishes. In order, however, to insure a uniform product, and to prevent reduction in quality due to a change in or elimination of essential steps, each manufacturer should be required to file with the inspection officials a "Process record," including the essential steps of the process to be followed. After the process is accepted by the inspection officials, no essential changes should be permitted without their consent. Such a record will be a valuable check in all cases, and an essential one for such finishes as those in class II, for which it is not at present feasible to apply any specific corrosion test for quality.

In the proposed classification, numerous electroplating processes are included. In fact, at the present time, the great majority of commercial electroplaters are engaged

upon military supplies of the most varied nature. In order to obtain an interchange of views upon this subject, a conference upon the electroplating of military supplies was held at the Bureau of Standards in March, 1918. The principal recommendations of this conference were as follows:

1. For protection of iron and steel against corrosion, only zinc coatings should be employed.
2. Where a black finish upon metal is required, a black nickel finish should be specified.
3. It is not practicable to specify the composition of solutions or conditions of operation to be employed for plating.
4. In the preparation of steel and iron for plating, sand blasting should be given preference to pickling.
5. Some form of corrosion test, such as, e.g., the salt spray test, should form the primary specification for the quality of zinc plating; the quantity of coating to be suggested only as a secondary specification.
6. Where the quantity of zinc coating is to be suggested or specified, it should be expressed in terms of weight per unit area (or piece) as determined by some stripping test.
7. If possible, some arrangement should be made for the employment of one or more experienced platers to serve as general plating advisers on military supplies.

In order to furnish information and assistance to the military authorities in connection with the specification and inspection of plating; and to the manufacturers upon the methods of producing the desired results, the Bureau of Standards has secured the services of two experienced electroplaters, Messrs. George B. Hogaboom and F. J. Liscomb. These and other members of the staff are engaged in investigations at the Bureau, and in visiting plants to advise and assist in the plating operations.

At the present time, the principal applications of plating upon military supplies are zinc, black nickel, and lead. A considerable amount of copper and nickel plating, and some tin plating, is still required, though in general, these methods are being largely superseded by zinc plating. In addition to what may be considered as regular plating operations, numerous special applications of plating to meet new or unusual requirements, frequently arise. The scope of the work on these subjects may be seen from the following illustrations:

ZINC PLATING.

Although the value of zinc coatings for protection of steel against corrosion has been pointed out by numerous investigators, the commercial application of zinc plating, or "electrogalvanizing," has been rather limited. Its usefulness is now appreciated however, and it is being frequently specified, e.g., on naval airplane parts, materials used in shipbuilding, hardware for ammunition boxes, and parts of the fuse mechanism for high explosive shells. There is good reason to believe that its use may be further extended to cover practically all steel parts for which any considerable protection against atmospheric or marine corrosion is required. For this purpose entirely satisfactory deposits may be produced in either the sulphate or cyanide solutions. The exact advantages of each, and the best composition and conditions of operation are now being investigated. In this as in other plating of military supplies, it is unwise, if not impossible, to specify the exact solution to be used. In general, it is more desirable to adopt such tests as will insure that the requirements are met, while leaving to the manufacturers the greatest possible option in the conditions of operation to be employed. In this way, more rapid production is assured and initiative and ingenuity are encouraged. At the same time, it is frequently necessary to assist the manufacturers to meet the requirements, in order that delays and rejections may be avoided.

LEAD PLATING.

Except for a few plants engaged in the manufacture of storage battery fittings, lead plating was until recently almost a scientific curiosity. In connection with gas shells, the demand for lead linings has brought about an increased use of lead plating, which is now being conducted on an extensive scale. Boosters and adaptors for gas shells, and certain of the gas shells are now being lead plated in large quantities. Another important application of lead plating is on the inside of underweight shells, whereby thousands of otherwise rejected shells are now being salvaged. For these purposes, the fluosilicate and fluoborate solutions are employed, though the indications are that the fluoborate solutions give better results, as well as being simpler to prepare and operate. A preliminary circular on these applications of lead plating has been prepared by the Bureau of Standards. Other applications of lead plating are being investigated, e. g., for lining chemical apparatus, coating threads of joints required to withstand high pressure, etc.

BLACK NICKEL PEATING.

A large amount of hardware, harness fittings and equipment used by the government is required to have a black or gray black finish, the so-called "government bronze." This is usually produced by the process known as black nickel plating, which may be applied to brass directly or after copper plating, and to steel which has been previously plated with copper or zinc. Two types of solutions are in general use, one consisting of nickel and zinc sulphates and sodium sulphocyanate; the other of nickel and zinc sulphates with the addition of cyanide, arsenic trioxide, sodium hydroxide, ammonium carbonate and possible other constituents. The first solution usually produces too deep a black color, and, in consequence, the latter type is mostly used on government work. Many of the formulas for such solutions are wonderfully and fearfully constructed. Needless to say, the maintenance of such a solution, in an even approximately uniform composition, would require the services of more chemists than platers! In spite of this fact, fairly satisfactory results are obtained by commercial platers. Efforts to simplify the operation of black nickel baths have thus far not yielded entirely satisfactory results, though it is hoped soon to improve conditions.

Among the special problems studied at the Bureau, is the production of very heavy deposits of nickel by electroplating. A process devised by Mr. C. P. Madsen has been investigated jointly by the Bureau of Standards and Bureau of Mines. By this process, the use of which has been furnished to the government for military purposes, it has been found possible to produce deposits of nickel up to one-eighth inch or more in thickness, and of most complicated shapes. The applications of this process, e.g., for the production of seamless tubes and other industrial uses is now being developed commercially. In general, it is believed that through such investigations and tests of plating as are now being made, incomplete and hasty as they must frequently be, the importance of this industry and the possibilities of new and improved methods will be emphasized, to the mutual benefit of the government and the industries. Throughout in this work the Bureau has received the active and hearty co-operation of the members of the American Electroplaters' Society, who have given their aid.

SOLDERS FOR ALUMINUM *

A Report of a Discussion on Aluminum Solders Carried on by the Bureau of Standards with the View of Discovering the Best.

By Paul D. Merica and Louis J. Gurevich.†

The question is frequently raised in connection with the use of aluminum and its alloys whether they can be satisfactorily soldered, and if so, by what method and with what metals or alloys. Aluminum, and to a lesser extent its alloys, can be welded quite satisfactorily by the oxygen-gas process, but often it is not desirable to heat the parts to be joined to the relatively high temperature necessary to weld them in this manner, owing to the resultant distortion of the parts, and a means of joining at lower temperatures is sought.

There are many special solder compositions for aluminum patented and sold today, with which it is claimed that soldering can be readily and satisfactorily accomplished, and the general interest in the utilization of this method is evidenced by the inquiries which are received by this bureau relating to it and to the many commercial solders. It is in response to these inquiries that the following discusion of solders for aluminum has been prepared, based upon special tests made at this bureau as well as upon current experience and the results and tests of previous investigation.[1]

Table 1.—Compositions and Properties of Some Aluminum Solders.

Name of Solder.	Chemical Composition. Tin, Per Cent.	Zinc, Per Cent.	Lead, Per Cent.	Aluminum, Per Cent.	Copper, Per Cent.	Other Metals, Per Cent.	Melting Range, Deg. C.	Cost Per Pound (a).	Tensile Properties. Tensile Strength, Lbs./in. 2.	Yield Point, Lbs./in. 2.	Elong. in 2 in., Per Cent.	Reduction of Area, Per Cent.	Manufacturer.
Sterling	62	15	8	11	3	1 (Sb)	228-503	$0.62	13,000 (c)	.....	1.6	1.3	Sterling Aluminum Solder Co., Brooklyn, N. Y.
Roesch	49	50	1	0.1	0.2	.....	195-360	.48	11,900	10,300	13.4	25.4	G. E. Roesch, Aurora, Ill.
Crown	63	18	1	13	3	2 (Sb)	.....	.64	14,500	.....	1.9 (b)	1.5	Crown Aluminum Solder Co., New York, N. Y.
So-Luminum	55	33	..	11	1	.....	.....	.56	9,800 (d)	.....	1.6	1.5	So-Luminum Mfg. & Eng. Co., New York, N. Y.
Seifert	73	21	5	..	..	1 (phosphor-tin) (f)	.....	.69	6.045	5,430	6.5	11.0	Seifert Superior Aluminum Solder Company.
Richards	63	37	..	1	..	.....	.....	.60	8,010 (e)	.....	9.0	17.9	Janney-Steinmetz & Co., Philadelphia, Pa.
Bureau of Standards—													
Sn-1 (g)	78	8	..	9	..	5 (Cd)	194-508	.86	14,300	.....	18	41	
Sn-3 (g)	84	9	..	5	..	5 (phosphor-tin) (f)	200-460	.80	11,200	9,400	8	41	
Sn-4 (g)	86	9	..	5	..	.....	200-434	.85	12,200	9,100	41	81	
Zn-1 (g)	..	75	..	5	..	20 (Cd)	264-375	.47	28,000	.....	..	1.9	

(a) On the basis of the following base metal prices (cents per lb.):

Tin	90	Aluminum	32	Antimony	14.5
Zinc	7	Lead	8	Phosphor-tin	100
Cadmium	150	Copper	23.5		

(b) In one inch.
(c) An average of 4 test, varying from 5,000 to 23,000 pounds per square inch.
(d) An average of 5 tests, varying from 4,120 to 17,500 pounds per square inch.
(e) An average of 4 tests, varying from 7,170 to 8,300 pounds per square inch.
(f) Five per cent. phosphor-tin.
(g) Specimens were chill cast in a metal mold, one-fourth inch square, with rounded edges.

1. APPLICATION AND ADHESION.

Whether aluminum can satisfactorily be soldered resolves itself into the questions: (1) Whether the solder can be applied and made to adhere to the aluminum, and (2) whether the joint thus made is stable and does not deteriorate. The choice of a solder composition is determined also by other factors, such as strength, ductility, etc., discussed below.

Aluminum solders, consisting usually of mixtures in various proportions of zinc, tin and aluminum, are usually applied in the following manner: The surfaces to be soldered are carefully cleaned with a file or with emery, and are then "tinned" or coated with a layer of the solder by heating the surface and rubbing the solder into it. The joint between the "tinned" surfaces may then be made in the usual manner with a soldering iron and the solders; a flux is not used. Evidently the efficiency of the joint depends upon the adhesion between the aluminum and the initial layer of solder.

A flux is sometimes recommended for use with commercial solders, consisting of stearic acid, rosin, zinc chloride, soap, sugar or mixtures of these. Tests made at this bureau have not shown any advantages in the use of such fluxes, either in the ease of application ("tinning") or in the resultant adhesion of such fluxed metal.

Table 1 contains the results of certain special tests on commercial compositions of solders as well as upon compositions made up at the bureau. From this table it will

*To be published as Bureau of Standards Circular.

†Bureau of Standards, Washington, D. C.

[1] W. S. Bates, paper read before Am. Chem. Soc., March, 1898.
J. W. Richards, Method of Soldering Aluminum; J. Frank. Inst., V. 137, p. 160; 1894.
C. F. Burgess and C. Hambuechen, Some Laboratory Observations on Aluminum; Journ. Soc. Chem. Ind., V. 22, p. 1135; 1903. Electrochem. Ind. 1903.

be noticed that the range of temperatures within which melting takes place in solders is usually large. Solders such as Sterling and Zn-1 are not very fluid until nearly at the upper temperature limit given, while the others become fluid within the lower ranges.

Strips of aluminum alloy and aluminum sheet were

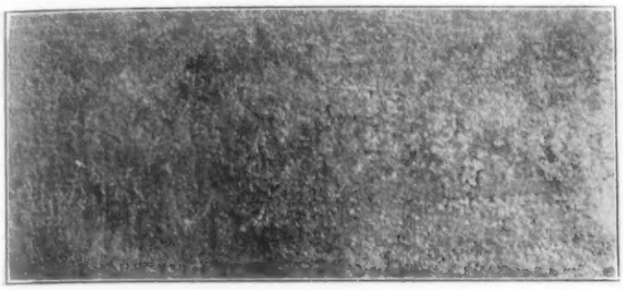


FIG. 1—SN-1 SOLDER, 7 DAYS IN TAP WATER. 1¤.

carefully cleaned and coated with the different compositions. This was accomplished quite readily in all cases; the resultant layer of solder without exception appeared to have "wetted" and joined quite thoroughly with the aluminum. The tinned strips were immersed in water for various periods of time and the effect of this treatment noted. Within 48 hours blisters appeared in the soldered layer of all specimens, as shown in photographs (1 to 6), varying from ½ to 2 or 3 inches in diameter. Upon breaking those blisters it was noted that the alu-

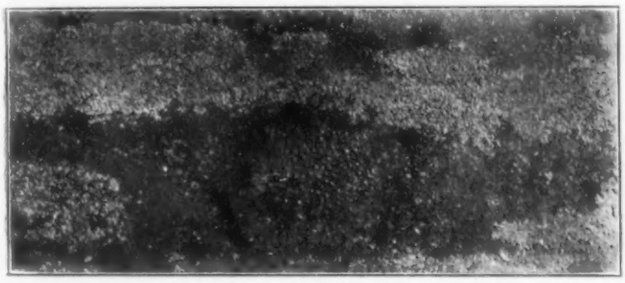


FIG. 2—SN-3 SOLDER, 7 DAYS IN TAP WATER. 1¤.

minum immediately below had never been alloyed with the solder. Within from 7 to 14 days the blisters grew in number and area until quite a large proportion of the "tinned" layer could be stripped off. In these tests it was noted that with solders such as "Sterling," which remained semi-solid up to high temperatures, finer blisters were produced. This is to be attributed to the fact that in order to apply such a solder a higher temperature was necessary to melt the solder, and that alloying of the

FIG. 3—SN-4 SOLDER, 7 DAYS IN TAP WATER. 1¤.

layer with the aluminum beneath thus took place more completely.

Besides the blistering, extensive corrosion took place during these tests. In all specimens the aluminum was rapidly attacked immediately adjacent to the "tinned" layer, gelatinous Al_2O_3 being formed as shown in photograph 7. In the case of the specimens soldered with zinc-base solders (Zn-1 and Roesch) the solder also was attacked, whereas the tin-base solder was not itself corroded.

2. STRENGTH AND DUCTILITY OF SOLDERS.

The Table 1 gives data of mechanical tests made on cast specimens of the various solders. There is not much variation in the strength of the solders tested, but there is considerable variation in their ductility. Small ¼-in.

FIG. 4—ZN-1 SOLDER, 7 DAYS IN TAP WATER. 1¤.

bars of solders such as Zn-1 and Sterling could not be bent more than a few degrees, whereas Sn-1 could be bent double and flattened out. It is highly desirable to have a ductile solder, and the presence of copper or antimony or of excess of aluminum, producing brittleness, is therefore to be avoided as there is no other necessity for it.

Some tests were made to ascertain the strength of soldered joints of sheet, the results being shown in Table 2.

FIG. 5—STERLING SOLDER, 7 DAYS IN TAP WATER. 1¤.

The strength of the solder in these joints was rarely equal even to its strength in the cast form (see Table 1). Failure occurred apparently both through the solder and at the bond.

3. ELECTROLYTIC BEHAVIOR OF SOLDERS.

The most common solders consist of tin as a base with

FIG. 6—ROESCH SOLDER, 14 DAYS IN TAP WATER. 1¤.

addition of zinc, aluminum and sometimes lead in moderate proportions. Tin, zinc and lead are all electro-

lytically electro-negative to aluminum. In contact with aluminum each of these metals causes a galvanic action by which the aluminum is attacked. These elements form simple eutectic binary alloys (except zinc-aluminum, aluminum-lead, and zinc-lead) with each other, such that a solder containing tin, zinc, lead and aluminum actually contains each of these elements, practically pure. The electrolytic e.m.f.'s of these metals to aluminum in a normal solution of their salts are given below:

Magnesium	+ .20 volts
Aluminum	± .00 "
Zinc	— .52 "
Cadmium	— .88 "
Tin	— 1.12 "
Lead	— 1.13 "
Copper	— 1.56 "
Zn-1	— .391 "

In .001 n $(Al)_2$ $(SO_4)_3$ solution

Sterling	— .300 volts
Sn-1	— .269 "
Zn-1	— .310 "

In { .005 n HCl / .001 n Al_2 $(SO_4)_3$

Sterling	— .312 volts
Sn-1	.321 "
Zn-1	.346 "

FIG. 7—STERLING SOLDER JOINT. PHOTOGRAPHED WET, SHOWING $AL_2(OH)_3$ DEPOSIT. 1¹.

Thus there is little difference between the different solders in this respect; they are all electro-negative to aluminum. Electrolytically they act as negative galvanic poles, accelerating the corrosion of the aluminum. The zinc-base solders, in addition, are themselves rapidly attacked.

4. COMPOSITION OF SOLDERS.

An idea of the energy which has been devoted to the discovery of special compositions of solders for aluminum is given by Table 3. For many of these solders extravagant claims are made for ease of application and for permanence; the first of these is generally justified, since solders within fairly wide limits of composition can readily be applied, when due care is exercised, but the second is not, since without exception joints soldered with such compositions when exposed to water or moist air are rapidly corroded and disintegrated.

5. GENERAL CONCLUSIONS CONCERNING ALUMINUM SOLDERS.

1. All metals or combinations of metals used for aluminum soldering are electrolytically electro-negative to aluminum; a soldered joint is therefore rapidly attacked when exposed to moisture, and disintegrated. There is no solder for aluminum of which this is not true.

2. Joints should therefore never be made by soldering unless they are to be protected against corrosion by a paint or varnish, or unless they are quite heavy, such as repairs in castings, where corrosion and disintegration

TABLE 2.—TESTS OF SOLDERED JOINTS. (d)

			Tensile Test.				
No.	Material of Specimen.	Type of Joint.	Tensile Stress Through Solder at Fracture. Lbs. per Sq. In.	Tensile Stress Through Metal at Fracture. Lbs. per Sq. In.	Elongation in 4 In. %	Reduction of Area. %	Fracture.
1	2-inch round aluminum bar.....	Butt	4,100	4,100	2	2	Coarsely crystalline through solder.
2	2-inch round aluminum bar.....	Butt	4,500	4,540	1	1	Coarsely crystalline through solder.
3	20 gage aluminum sheet.....	Butt	7,900	7,900	6	2	Through solder.
4	20 gage aluminum sheet.....	Butt	7,600	7,600	4	4	⅔ through solder, ⅓ through bond.
5	20 gage aluminum sheet.....	Special butt (a)	4,800	14,300	2	6	Through solder.
6	20 gage aluminum sheet.....	Special butt (a)	4,100	14,400	4	7	⅓ through solder, ⅔ through solid metal.
7 (b)	20 gage aluminum sheet.....	Special butt (a)	3,100	9,500	5	2	Through solder.
8 (b)	20 gage aluminum sheet.....	Special butt (a)	3,100	10,200	5	2	Through solder.
9	20 gage aluminum alloy metal....	Special butt	1,400	5,200	0	6	At bond.
10	20 gage aluminum alloy metal....	Special butt	1,800	5,500	0	0	At bond.
11 (b)	20 gage aluminum alloy metal....	Special butt	2,100	2,100	0	0	Through solder.
12 (b)	20 gage aluminum alloy metal....	Special butt	1,500	3,500	0	0	At bond.
13 (c)	½ x 2-inch aluminum bar.....	Butt	1,300				Through bond.
14 (c)	½ x 2-inch aluminum bar.....	Butt	2,600				Through bond.
15 (c)	½ x 2-inch aluminum bar.....	Butt	1,700				Through bond.

(a) Flanged and abutted to give greater section.
(b) Immersed in water 7 days before testing.
(c) Soldered with So-luminum solder.
(d) Nos. 1-12 incl. soldered with Sterling solder.

Measurements made of the electrolytic e.m.f. of solders to aluminum gave the following results:

In 0.1% H_2SO_4

Sterling	— .364 volts[2]
Sn-1	— .445 "

[2]The sign — indicates that this solder was negative to the aluminum; i. e., the current flowed from the aluminum to the solder in the solution.

of the joint near the exposed surface would be of little consequence.

3. Solders are best applied without a flux, after preliminary cleaning and tinning of the surfaces to be soldered. The composition of the solder may be varied within wide limits; it should consist of a tin-base with addition of zinc or of both zinc and aluminum, the chief function of which is to produce a semi-fluid mixture within the range of soldering temperatures.

Suggested ranges of composition:

Tin-Zinc Solders		Solders	
Tin	remainder	Tin	remainder
Zinc	15 to 50%	Zinc	8 to 15%
Tin-Zinc-Aluminum		Aluminum	5 to 12%

4. The higher the temperature at which the "tinning" is done the better the adhesion of the tinned layer.

TABLE 3.—COMPOSITION OF PATENTED OR COMMERCIAL SOLDERS.

Year. Patent.	Per Cent. Sn.	Zn.	Al.	Pb.	Cu.	Sb.	Ag.	Miscellaneous.
1904—Brit. 17,031	66.66	31.23	1.04	1.04	....	....	....	
1905—Fr. 355,761	25	....	70	....	5	....	....	
1906—Ger. 197,510	60	25	2	....	10	....	....	3 Cd.
1907—Brit. 14,157	72.72	24.24	....	....	....	....	3.04	
1907—Fr. 374,750	50	16.66	....	33.33	....	....	....	
1907—Fr. 376,383	10.14	20.28	21.74	10.14	....	....	....	1.14 Bi; 14.49 Hg; 21.74 brass.
1907—Fr. 379,211	....	85	4.3	....	10.7	....	....	
1907—Brit. 13,689	78.68	19.67	1.31	....	....	....	0.33	
1907—Brit. 13,689	70.60	24.94	4.15	....	....	....	0.21	
1907—Fr. 381,878	13.33	13.33	....	....	....	6.6	....	66.66 Mg Cl.
1908—U. S. 906,383	47.5	....	....	47.5	....	....	....	5 Ca.
1908—U. S. 900,367	68	29	....	....	....	2	....	1.0 Phosphorus.
1908—Fr. 394,115	75.94	20.27	2.53	....	....	....	1.26	
1908—Fr. 394,115	69.38	24.49	4.08	....	....	....	2.04	
1908—Fr. 396,345	19.76	59.29	15.80	....	....	....	4.74	0.39 Phosphorus.
1909—U. S. 931,523	....	95.26	....	....	....	3.54	....	
1909—U. S. 938,423	80	....	17	....	....	....	....	0.7 Ni; 2.3 Mg.
1909—U. S. 939,494	49.05	20.31	....	26.06	1.10	3.43	....	
1909—U. S. 941,835	76.10	21.8	....	....	2.10	....	....	
1909—U. S. 968,203	85.1	....	10.8	....	....	....	....	1.35 Cd.; 2.75 Mg or 1.0 Pb.
1909—Brit. 9,654	....	80	15	....	....	5	....	
1911—U. S. 989573	65.77	12.22	0.65	17.42	3.09	....	0.28	0.53 Phosphorus.
1912—Brit. 27,835	85	....	10	....	....	....	....	5 P-Sn (a)
1912—Brit. 27,835	85.68	7.14	3.51	....	....	....	....	1.78 P-Sn (a); 1.78 soft solder.
1912—Brit. 29,239	61.54	38.46	....	....	....	....	....	
1912—Brit. 29,239	59.26	40.76	....	....	....	....	....	
1913—U. S. 1,052,693	38	30	....	....	....	....	....	32 P-Sn (a).
1913—U. S. 1,067,016	45.45	45.45	....	4.54	....	....	....	
1913—U. S. 1,078,114	86	....	....	....	....	....	....	14 Bi.
1913—U. S. 1,083,828	....	99.35	....	0.18	0.30	....	....	0.17 Fe.
1913—U. S. 1,092,340	30	52	17.5	....	....	....	....	0.5 Ni.
1913—Fr. 464,716	60	....	30	....	....	10	....	
1913—Brit. 23,077	58.6	23.4	....	17.6	....	....	....	
1914—U. S. 1,093,403	50	25	....	25	....	....	....	
1914—U. S. 1,107,082	47.35	24.92	24.92	....	0.49	1.74	....	0.49 Bi; 0.12 soft solder.
1914—Brit. 7,928	5	30	....	....	....	....	....	65 Cd.
1915—U. S. 1,161,612	75.29	....	5.89	18.82	....	....	....	
1916—U. S. 1,194,101	25	25	12.5	12.5	....	12.5	....	12.5 Bi.
1916—U. S. 1,195,955	25	50	....	25	....	....	....	
1917—U. S. 1,222,158	69.07	1.44	....	28.77	....	....	0.72	
1917—U. S. 1,224,491	36	20	....	44	....	....	....	
1917—U. S. 1,239,854	53.84	15.38	7.69	23.07	....	....	....	
1917—U. S. 1,239,785	65.39	32.69	....	....	1.86	0.06	....	
——A. G. LeChatelier	....	20	....	....	....	....	....	80 Cd.
——A. G. LeChatelier	....	15	....	....	....	....	....	85 Cd.
——A. G. LeChatelier	....	30	....	....	....	....	....	70 Cd.
——Wuest	....	50	30	....	20	....	....	
——Wuest	....	65	20	....	15	....	....	
——Wuest	....	80	12	....	8	....	....	
——Wuest	....	85	9	....	....	....	....	6 Hg.
——Wuest	....	88	7	....	....	....	....	5 Hg.
——Wuest	....	90	6	....	....	....	....	4 Hg.
——Wuest	....	94	4	....	2	....	....	
——Wuest	97.08	....	....	....	....	....	1.92	0.97 Ni.
——Burgess and Hambuechen	76	21	3	....	....	....	....	
——E. Hirsch	93.75	3.12	....	....	....	....	1.56	1.5 Spurious gold leaf.
——E. Hirsch	91.5	3.92	....	....	....	....	2.61	1.96 Spurious gold leaf.
——Ferman	....	90	6	....	4	....	....	

(a) 5% Phosphor-Tin.

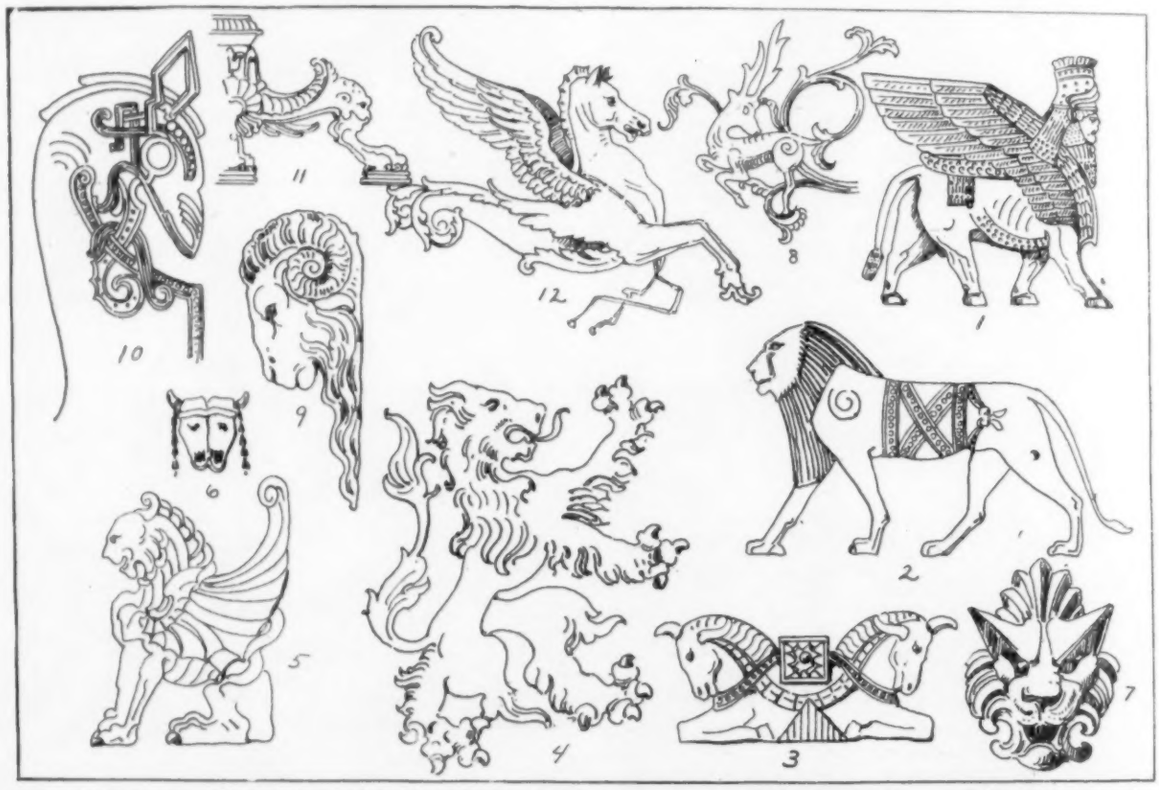
DESIGN VALUE OF DECORATIVE MOTIFS

A Series of Articles on This Interesting Subject Has Been Prepared by the Author with the Object in View of Giving the Student Craftsman in Art Metal Work a Comprehensive Idea of the Design Value of Decorative Motifs, Their Characteristics Peculiar to the Particular Period or Style in Which They Appear and So Far as Possible to Explain Their Origin, Symbolic Significance and Decorative Value. It Is the Author's Sincere Hope That the Series Will Fulfill the Purpose for Which It Has Been Prepared—Sixth Paper.

Written for the Metal Industry by A. F. Saunders, Designer Benedict Manufacturing Company, East Syracuse, N. Y.

ANIMALS, BIRDS AND FISHES.

From prehistoric times down to the present there has been a constant effort on the part of man to capture and fix by means of artistic representation the fleeting motions of the furred, feathered, and finned inhabitants of the earth, the air and the sea. The primitive savage decorated his tools and weapons, even the walls of his dwellings with scratchings or paintings of the animals he hunted and lived upon.



1, WINGED BULL, ASSYRIAN; 2, LION, EGYPTIAN BAS-RELIEF; 3, STEER HEADS, PERSIAN; 4, HERALDIC LION, RAMPANT; 5, WINGED LIONESS, MODERN FRENCH; 6, OX SKULL (BUCRANEUM), ROMAN FRIEZE MOTIF; 7, LION HEAD, MODERN FRENCH; 8, STAG MOTIF, SARACENIC, CARVED ORNAMENT; 9, RAM'S HEAD, ROMAN AND LATE RENAISSANCE; 10, HEAD OF SEA HORSE, PROW OF VIKING SHIP, SCANDINAVIAN; 11, FOOT OF CANDELABRA, POMPEIAN, LIONESS HEAD AND PAW MOTIF; 12, WINGED HORSE, FRENCH EMPIRE.

Many of these crude efforts at decoration show an astonishing sureness of vision in catching the quick motions of animal life, indeed they show a marked appreciation of animal nature that is rare in any period of art. The picturing of animal forms is prompted by several distinct reasons. First: There is the simple instinctive pleasure that a true artist finds in depicting living objects. Second: There is the fascinating subject of symbolism, leading to the infinite representations of animal life, especially those wild members of the animal kingdom which afford man the sport of the chase; for example, what better symbol of alertness and speed than the stag? Or of majestic power than the lion?

Primitive tribes believed themselves bound by a natural kinship to the members of the animal world. To them an animal became an emblem and guardian spirit of the tribe, hence the fetish worship of the savage. It is really but a step from such symbols, or totems, of the savage tribe to the crest or badge of a clan, or nation, of civilization. Each in a way symbolize a desired spiritual affinity to the characteristics of the particular animal selected. Lastly: There is the depiction of animals for superstitious or religious reasons, thus we find certain animal forms used in Christian art; for example: the lion is regarded as the symbol of the Redeemer, also as the attribute of the evangelist St. Mark, hence his frequent use as a decorative motif on many articles of religious use.

Both Assyrian and Egyptian artists excelled in representing animal forms, though in different fashions. The Assyrian was prone to exaggerate the muscles and broadened the forms, delighting in depicting power and strength. The Egyptian on the other hand elongated his figures, giving them the appearance of elegance and grace. (Fig. 2, Plate 11.) The Assyrian idea is best seen in the use of such collosal figures as the winged bull guarding the portals of his palaces. (Fig. 1, Plate

11.) This human headed monster was the emblem of the great god "Nin," a fierce Assyrian deity, supposed to receive his inspirations from the planet Saturn. It also typified generally the union of the intellectuality of man and the physical power of the beast. In this same sense the Egyptian used the Sphinx to signify the religious mystery.

Of all animal motifs the lion easily holds first place in ornamental fauna, his compact, proportionate build, his majestic carriage, and striking muscular development offer grateful problems to art. From the earliest times his majesty the Lion has enjoyed the title of "King of Beasts," and well he deserves this honor, at least in an artistic sense. Among the Greeks and Romans the lion was considered as the guardian of the springs and temples, hence his frequent use as a decorative motif on vessels for water. At fountains and about the entrances of temples the dormant lion was the symbol of the fallen hero.

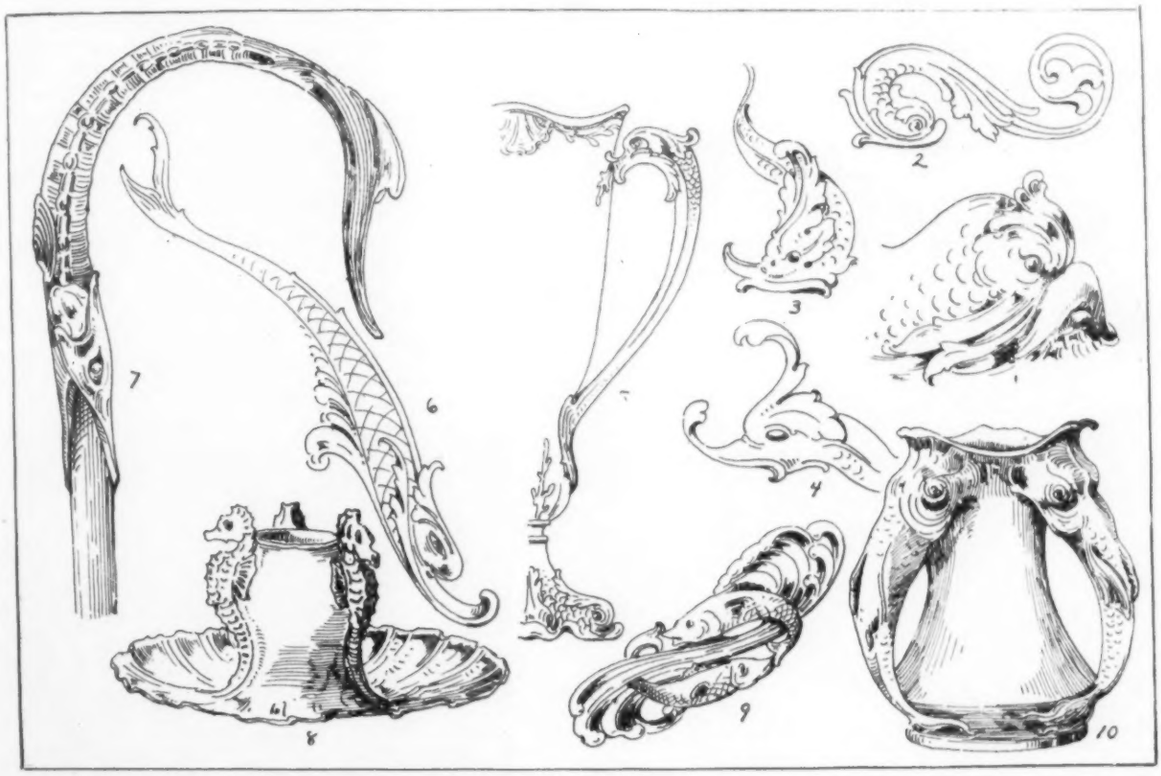
During the twelfth century the Crusader introduced the lion into heraldry. He became the most popular and picturesque animal used. For centuries he has been the insignia or badge of royal families. To this day the lion forms the right-hand supporter of the Royal Arms of Great Britain, presenting a most decorative and formidable appearance in his rampant pose. (Fig. 4, Plate 11.)

In the various periods of the Renaissance, animals of many kinds were interwoven with all sorts of fantastic ornaments, oftentimes the whole figure was used, again only the head and forebody. Where animal heads were used they generally acted as supports for festoons of flowers or fruit. In addition to the lion we find the ram, panther, tiger and lynx in the Greco-Roman and late Renaissance, also the skull of the ox and goat, the decorative use of which with the head of the ram had a special religious significance, these big sacrificial animals. (Figs. 6, 9, Plate 11.)

Man's most useful and faithful animal, the horse, while offering certain difficulties in the way of artistic imitation, has been used more or less as a decorative motif in some styles of ornament. Figure 12, Plate 11, shows a conventional treatment of the horse as found in the semi-classic style of the French empire. In modern art the horse is used primarily as a decorative motif in connection with articles designed as prizes or trophies for racing events.

What appears to be a conventional form of horse head is frequently found in the interlaced tracery of old Scandinavian ornament (Fig. 10, Plate 11), though the fact that this same peculiar conventional motif was invariably used to decorate the prow of many old Norse ships, leads one to believe that perhaps it was intended to represent some imaginary sea monster rather than the horse. Its origin, however, remains an open question, we accept it for what it seems to be and must admit its value as a decorative motif.

When we think of anything Scandinavian it arouses visions of stormy seas, hardy sailormen, and savors of fish. As decorative motifs fish have not been used very extensively, yet the denizens of the sea offer a wide range of decorative possibilities in design. Most fish forms are capable of artistic treatment in a decorative manner. The very action of a fish gliding through the water, leaping into the air, suggests graceful curves, the scaly body, the radiating lines of fin and tail suggest decorative motifs in design. For example, such fish as the trout, pickerel or sturgeon, all common to our native waters, with their long, slender proportions, beautiful markings



1, DOLPHIN HEAD, MODERN FRENCH; 2, DOLPHIN RENAISSANCE; 3, DOLPHIN HEAD, RENAISSANCE; 4, DOLPHIN HEAD, RENAISSANCE; 5, DOLPHIN USED AS HANDLE OF CUP, FOUR DOLPHIN HEADS FORMING THE BASE; 6, FANTASTIC FISH MOTIF; 7, HANDLE OF PARASOL IN GOLD AND ENAMEL, FISH MOTIF; 8, SEA-HORSE, USED AS DECORATIVE MOTIF ON SILVER AND BRONZE MATCH HOLDER; 9, SILVER AND ENAMEL BROOCH, FISH AND WAVE MOTIF; 10, FISH MOTIF USED AS HANDLES OF LOVING CUP.

and fine colorings. Figures 6, 7, 8, 9, 10, Plate 12, show several suggestions of the use of fish as decorative motifs in metal work. While on the subject of fish motifs, we must include the dolphin. Of course, we know that the dolphin is not a real fish at all, but a mammal. This half fish, half animal, enjoys an unusual amount of attention in decorative art. I hardly know of any one creature that has been conventionalized into so many different decorative forms as the dolphin. In ancient times the dolphin was held in a kind of veneration that protected it from persecution. As a symbolic representation it is the companion of nymphs, nereids and tritons, and of "Arion," "Aphrodite," and that old god of the briny deep, "Neptune," with whose trident he is often combined in ornament.

We find the dolphin on many antique coins, on Graeco-italic terra-cottas, in Pompeian wall paintings, and on numerous vessels and utensils used by the Greeks and Romans.

When France was ruled by kings, the heir to the throne bore the title of "Dauphin" (Dolphin), thus this fishy motif appears frequently in the different periods of French decoration. (Figs. 1 to 3, Plate 12.)

In the Italian Renaissance his appearance is due more to his decorative qualities rather than for any symbolic reason, forming parts of scroll systems, the body or tail trailing out into various scroll forms. (Figs. 2, 3, 4, 6, Plate 12.)

In modern art the dolphin still retains its popularity as a decorative motif, forming the principal motif of many designs where the decorative elements are intended to be suggestive of things nautical. Figure 5, Plate 12, show a conventional form of dolphin used as the handle of a trophy cup.

The sea, like the land and air, contains a veritable storehouse full of material that requires but a little imagination on the part of the artist to convert into decorative use.

The next article of the series will explain the use of artificial objects as decorative motifs.

SEPARATING WHITE METAL AND BRASSES

AN INTERESTING PROCESS TAKEN FROM A GERMAN SCIENTIFIC JOURNAL AND PUBLISHED FOR THE BENEFIT OF AMERICAN METAL MELTERS.

Mixtures containing different metals are frequently obtained in the course of technical processes in the form of waste products; for instance, when turning brasses lined with a white metal there is usually obtained a mixture of white and red metal filings.

In order to separate the different components of such mixtures the fact that they melt at different temperatures is utilized by heating them on a movable sieve to a temperature at which one of the metals, say, the white one, melts without alloying itself with the other metal, in this instance the red one.

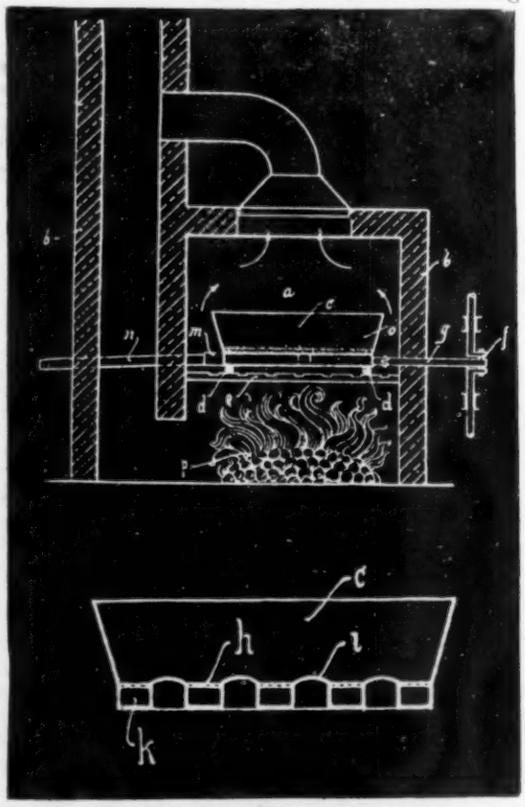
This method as hitherto carried out had, however, to contend with very considerable practical difficulties, mainly due to the fact that the white metal has usually been unable to flow off immediately after its liquefaction, with the result that the residue remaining on the sieve has again consisted of a mixture, and that it was consequently impossible to recover the entire amount of the valuable white metal.

Now according to this improvement such a movement is imparted to a sieve-like jig-screen that, as practical experiments have demonstrated, it becomes easy to effect the complete separation of the two components of the mixture; the movement imparted to the screen so acting on the mixture as to make it impossible for the unmolten filings to collect on the bottom of the screen and so prevent the escape of the molten metal, this being the most obvious defect of apparatus as heretofore constructed.

The novel method of imparting movement to the sieve in accordance with the invention, which cannot be effected by hand, results in displacing the filings a very little distance from the position occupied by them by jerks and simultaneously throwing them upwards. This may be effected, for example, by causing the sieve to travel on wheels over one or more rails provided at short intervals with teeth, as well as over continuous guides.

The accompanying drawings illustrate by way of example apparatus in accordance with this invention, wherein in the heating chamber *a* of the melting furnace *b* is arranged the melting truck *c*, supported by means of wheels and rollers *d* on racks *e*, and moved by means of mechanism consisting of a suitably actuated crank *f*, an eccentric *o*, and a connecting rod *g*.

The melting truck *c* contains the screen, which is composed of sieve-like plates H and continuous plates *i*. To prevent the escaping molten metal from being thrown against the walls of the furnace in consequence of the movements of the sieve there are provided below the plates *h* receptacles *k*, which have an outlet into a transverse passage *m* arranged in the truck containing the



FURNACE FOR SEPARATING WHITE AND RED METALS.

screen, whilst an outflow pipe *n* fixed to the truck passes through the wall of the furnace and terminates in a receptacle for collecting the metal.

The uninterrupted plates *i* are preferably upwardly curved and are directly heated from below by the heating gases.—"Metall und Erz."

SOLDER, ITS USE AND ABUSE

A Portion of an Address Delivered Before the Metals Division of the American Institute of Mining Engineers at the Annual Meeting, Milwaukee, Wisconsin, October 10th, 1918.

By Milton L. Lissberger, President Marks Lissberger and Son, Inc.

CLASSIFICATION

For the purpose of conserving, tin solder should be separated into two classes.

First: That which is used strictly for soldering purposes, the joining and holding together of two pieces of metal.

Second: That which is used primarily for filling so as to prevent the escape of the contents of the container and in which the joining is a minor if not an entirely negligible factor.

To explain this: If two pieces of metal are laid one on the other, and solder is then applied, so as to make one continuous surface, that is the first or joining use.

If an interlocking seam is formed in which the ends are so interlocked as to remain permanently joined, and solder is applied to fill up this seam so as to make it liquid and air tight, but not performing any material function in holding the two pieces together, then it is used not as a solder but as a filling metal, and it is on these filling metals that the greatest conservation of tin can take place. All that is necessary is that the metal shall flow into the seam, and shall solidify into one solid mass through which no liquid nor gas will penetrate.

ABUSE OF SOLDER

The greatest abuse of solder is in the use of high tin mixtures on these filling metals. A mixture of 25% tin and 75% lead worked at the proper heat, and with the proper fluxing, is high enough for any filling purpose, and this has been demonstrated in the practice of the oil canners, particularly that of the largest of all of them, the Standard Oil Company.

One of the methods by which many consumers have fooled themselves into the necessity of using a higher tin content than is absolutely required on their work, is that hand tests have been made to determine the lowest mixture that will do the work, and this fooling has been done due through lack of familiarity with the fact that no matter how thouroughly you mix tin and lead, the lead will segregate from the tin.

While most of this filling work is done in baths on mechanical machinery, the users have not realized that their bath solders are considerably higher in tin at the top through which the container is being carried and taking up solder than the actual tin contents of the solders put into the baths.

DEEP SOLDER BATHS

Many consumers in the past few years have had this brought home to them by practical results without really understanding what has occurred. By this is meant that where taking the most commonly used solder, 40/60, on automatic can making machinery, and this solder has not worked entirely satisfactory to the operating company, the foreman has suggested a deepening of the bath. When one or two inches has been added to the depth of the bath, it has been found that the solder was working very much better. We know now why this betterment of work takes place, but few manufacturers know the reason. They simply know the result.

Frequently, when recommending deeper baths, the suggestion has been looked upon rather suspiciously, but in no case has this failed to increase the quality of the finished work.

Hence one of the best means of conserving solder in can-making is to deepen all baths whether on line machinery or for hand dipping.

SOLDER DROSS

Nearly every one who has been interested in the reclamation of solder drosses has attributed the fact that the analysis of the solder dross has shown a higher percentage of tin contents than did the original solder used, to the fact that tin would oxidize more rapidly than lead. This is a fallacy. The reverse is the fact. Lead oxidizes more rapidly than does tin, and the only accounting for the higher tin contents in solder dross than the original tin contents of the solder, is that on these baths the lead is gradually working towards the bottom, the tin to the top, and the surface of the molten solder is exposed to the air, drawing oxygen from the air, and thus producing an oxide of solder richer in tin than the original solder that was put in the bath.

Hence, for line machinery and where hand dipping is practiced the baths being materially deepened, a considerably conservation of tin with exactly the same resulting effects of the solder used may and will be obtained. This is probably the greatest abuse of solder and the one that promises the greatest saving of tin if properly handled.

This demonstration is very simple, and in many plants can be made at such a slight expense that you gentlemen are urged to spread the doctrine as rapidly and as widely as you can.

Of course, it is unnecessary to tell any practical man that in these filling operations it is not necessary to dip deeply. A surface dipping is sufficient. In fact all users of solder may have observed the action of these baths and all have noticed how much and what a decided capillary action takes place where solder is in an absolutely liquid state.

Overheating of solder while very detrimental to the work is useless, and causes some but not a very great waste of tin because the overheating produces an oxide. The reclaiming of waste materials has reached nearly every one who produces any quantity of oxides so that they have been educated to the value thereof, and while it may be a source of considerable loss to the package manufacturer in dollars and cents, it is yet but a small loss in tin because the reclaiming of these so-called drosses which are really oxides has been brought to such a high degree of perfection that very little of the original contents of metal is lost in the smelting and refining thereof.

AVOID OVERHEATING

In these days, however, where every ounce of tin should be conserved and guarded both as to insure a sufficient supply to go around for the most essential work, and to save on the useless transportation of anything, particularly on an article that comes from such long distances by boats. Overheating should be avoided, and the top of all the baths covered with a protecting material, such as sal-ammoniac, oil, charcoal, ash, as the particular work would indicate how it should be used without harm to the finished product.

As in later years the so-called Sanitary Can use has spread through nearly all of the food product canning, and as in oils and other containers the use of the interlocked seam has grown, it is safe to assume that over 75% of the entire tonnage of solder is used for filling purposes, hence, the saving of tin in this direction multiplies itself very rapidly into a material conservation of tin.

Again, attention should be drawn to all who work around these baths that every iota of solder oxide should

be preserved, and to see that it reaches the reclaimer who, in this country, bears the misnomer of smelter and refiner.

When it is considered that a teaspoonful of so-called solder dross, oxide, contains enough solder to make a five-gallon can or one hundred Number One cans, it will be seen how important the looking for this dross is. In many plants, even those of some of our largest consumers of solder, this dross is not handled with sufficient care. The gathering of it is not watched carefully enough. Too much of it gets into the floors and is swept out as dirt. No housewife would expect to have her meals served unless each and every utensil used was scrupulously clean.

CLEAN PLANTS NECESSARY

Going through plant after plant where solder is used it will be rarely found that the container manufacturer is near as cleanly as he would insist upon his cook being.

In this regard oxide will be found all over the machinery adjacent to the solder bath, and inquiry will show that it is rare for a thorough cleaning and gathering together of the oxides to take place more than once a week.

Fire will purify these reclaimed materials when properly refined and as far as purity is concerned they will compare favorably with the Virgin materials, but that word properly is the whole story in a nutshell.

REFINING SCRAP

Too little attention has been paid to the proper refining of these scrap metals. They have simply been put in a kettle, melted down, and then brought up or down to the required mixture. This is not sufficient and right here the statement is going to be made that the reclaimed metals at no time are equal to Virgin Metals, no matter how much refining is done. For certain classes of work they are desirable and efficient, but to say with truth that they are equal is an impossibility.

In the first place, reclaimed metals can be likened to the human body. A man in perfect health after going through strenuous work lacks the stamina of his early youth. Take a man who has had pneumonia, and comes through alright. Examination a year or two after he has fully recovered shows as far as the physical examination can show that his heart and lungs are in perfect condition, yet no one would expect that man to enter into a long grilling foot race, and carry it through with the same speed and effort and with the same lack of deleterious results as would a man of the same age who had never had pneumonia.

The steel maker recognizes this fact. He is a large consumer of scrap iron and steel, but you will always find that the good makers of steel limit the proportion of old material that they use, not that the resulting steel does not show the self same chemical composition, but because the steel maker recognizes that steel produced mainly from scrap is inferior in its physical quality, and this while latent, sooner or later shows up.

PERMANENCY MOST IMPORTANT

The permanency of a metal is just as important as is the physical quality it exhibits when tested or first used, and no refined metal has the same permanency as has Virgin Metals.

In other words, the use of metal from time to time affects its physical permanency but the margin of safety in the quality and quantity of solder used is so large and the length of time that solder is required on the container before its contents are used is so comparatively short that this permanency can in a great measure with justice be disregarded.

To get back to the proper use of tin in solder on line making machinery. Wire solder flows quicker than where solder is used in larger forms such as on seams, and this wire can also have a material reduction in tin contents without detriment to the work.

When it comes to the matter of hand working, the use of solder has become so much a matter of personal equation that it is hard to prescribe any fixed rule, and in these days where payment by piece work is becoming almost the invariable rule, naturally the piece worker wants the freest flowing solder obtainable, and in the most convenient form for handling.

THE STRONGEST SOLDER

After careful experiments I am inclined to believe that for soldering purposes in round figures 46% tin, 54% lead is the strongest mixture that can be used, and particularly when ¼ to ½ per cent of antimony is added to the mixture. The results of tests on practical work of solder has very clearly demonstrated to our satisfaction that 46% tin, 54% lead is the most desirable mixture that can be used where hand work is being done.

GOVERNMENT STANDARDS

Therefore, the Bureau of Standards, which has been backed by the War Industries Board, suggests that the highest mixture of solder to be used should be 45% tin, 55% lead as this is a high enough mixture for any soldering purpose, and certainly applies to tin work, and the fluidity should be sufficient to satisfy any reasonable worker.

We cannot in these times be asked for the sake of the individual gain of the piece worker to imperil the supply of tin for all essential work, by using a higher mixture than 45% tin and 55% lead.

On any bath work 40% tin should be the highest tin content used, and on most bath work is has been demonstrated by various manufacturers in the past few months that from 35% to 38%, according to the nature of the work, will give ample satisfaction. In peace times, with a supply of tin that is more than sufficient to go around, higher tin mixtures may be considered, but it would appear from all experiments that have been made that 45% tin and 55% lead on hand work and 40% tin and 60% lead on bath or line work, will give satisfactory results when the solder is made properly.

SHORTAGE OF BRASS AND COPPER IN GERMANY.

Proof of the increasing shortage of copper and brass in Germany is given in the latest reports that torpedoes used by submarines are now being made without these metals. The torpedo has been so stripped that it becomes practically a skeleton compared with the former efficient mechanism. The elimination of the delicate and expensive propelling and starting apparatus has been done at the expense of accuracy and range of fire. Under normal conditions the torpedo should be effective at 2,000 yards or more, but at the present time it is reported that the submarines lately fire a torpedo at less than a 500-yard range, and if found to be safe they will approach even nearer than this to the attacked ship. From the above it will be seen that the submarine commander must pay in danger what they have saved in producing an inferior torpedo.

CALLS IN NICKEL COINAGE.

It is reported that Germany is calling in her nickel coinage, the metal of which is needed for projectiles, and is substituting zinc for minting coins of this class.

Authority has just been given for the minting of 10,000,000 marks' worth of zinc 10 pfennig pieces.

BLACK FINISHES ON IRON AND STEEL

A Discussion of the Most Suitable Processes for Commercial Operation Based on Large Scale Production.

Written for the Metal Industry by Elmer S. Whittier, Chief Chemist, Landers, Frary & Clark, New Britain, Conn.

This resume of the art of coloring iron and steel black is taken from the writer's notes which cover several years of experiments and observation of actual performance of processes in the factory. Only that which seems adaptable to large scale production is taken up for discussion.

There are three general procedures under which all surface coloring can be classified:

1. Immersion for various lengths of time in different solutions whose temperatures are not over 212° F.
2. Immersion in fused baths of chemicals, heat tinting and muffle processes.
3. Electrolytic processes.

When considering different methods of applying a black finish, the following factors must be studied before the process is adopted.

1. Cost of chemicals and time required.
2. Effect of heat if a heat process is used.
3. Resistance of the finish to atmospheric corrosion.
4. Durability.

There are some methods of producing a black, one of which will be mentioned later in this article, in which the cost of chemicals would be prohibitive except on small parts of scientific instruments or in touching up uncovered spots of other processes. Again on small articles where large quantities can be colored in one run, certain methods would be acceptable, but the same methods could not be used on large articles on account of the length of time. If a steel article has been heat treated for specified physical properties, a process in which a high heat is used should not be considered unless the heat can be used for a combination of purposes such as coloring and tempering simultaneously. The resistance to atmospheric corrosion is very important and the choice of methods will be governed by comparative tests, for while one can say in a general way that one finish is more resistent to corrosion than another on account of salt spray tests, etc., the test under working conditions will give the most information.

Failure to use a process which is best suited to the proposition at hand can be attributed to too little and careless experimentation. The preparation of the surface before coloring is very important. One should try samples which have been treated in the following different manners:

Cleaned with electric cleaner.
Cleaned in soda and scratch brushed.
Cleaned in electric cleaner and sand blasted.
Cleaned in electric cleaner and sand rubbed.
Cleaned in electric cleaner and sand tumbled.
Cleaned with benzine or gasoline.
Pickled in one of the following acid mixtures:
Water 3 parts—nitric acid 1 part.
Water 3 parts—muriatic acid 1 part.
Water 95 parts—sulphuric acid 5 parts.
Water 70 parts—sulphuric acid 30 parts.
Water 80 parts—nitre cake 20 parts.

At first one might think that any standard method of cleaning an article for plating would be satisfactory, but this is one of the peculiar phenomena of metal coloring which is met when preparing the surface. The writer has found that while one method of cleaning an article will be proper for one process, in another process the surface will not color satisfactorily unless another way of cleaning is used.

Forgings on which the machining has not gone below the scale in certain spots, but which have been ground and polished so that the scale is as bright as the remainder of the part cause much trouble in coloring. The scale is not affected by the coloring agents and light spots are left after the coloring process. This trouble can be remedied by having a coarser finish on the last polish, but the best method is to allow for more machining on the forging. This trouble is not experienced so much on heat methods as on immersion methods.

IMMERSION PROCESSES

Probably the oldest method used at the present time is the Browning Process. This is used very extensively on munitions parts but owing to the time which is required for the complete process, the bulky equipment and the unreliability of the process in different kinds of weather and climate, it is rapidly being replaced by more efficient methods. When this finish is applied in the proper manner it gives a very beautiful black but the conditions have to be just right and it is quite difficult to control the process. There are many different methods of applying the coloring acid but the following scheme is used generally: The articles are cleaned in a soda kettle and then scratch brushed. The first coat of acid is applied and after drying a second coat is put on. The articles are placed in a dry kiln which is at a temperature of 145° F. for one-half hour and are then transferred to a kiln where the humidity is very high and the temperature about 145° F. After remaining in this wet warm atmosphere for two hours the articles are removed and rinsed in boiling water. They are then scratch brushed and sent through the previous part of the process twice. After the final scratch brushing they are oiled. Following are four typical solutions:

No. 1.

Copper sulphate	2 ounces
Nitric acid	4 "
Mercuric chloride	4 "
Grain alcohol	17 "
Ferric chloride	9 "
Water	9 "

No. 2.

Grain alcohol	3 pints
Ethyl nitrite	3 "
Tincture of iron	3 ounces
Mercuric chloride	3 "
Nitric acid	1.5 "

No. 3.

Copper chloride	1 ounces
Bismuth chloride	1 "
Muriatic acid	6 "
Mercuric chloride	3 "
Water	40 "

No. 4.

Grain alcohol	8 ounces
Ferric chloride	1 "
Water	9 "

The following formula gives a good black on steel but is expensive on account of the selenious acid. A bottle of this solution should be at hand when doing any coloring by other methods as it is an excellent mixture for touching up spots which have failed to color:

Selenious acid	6 grams
Copper sulphate	10 "
Nitric acid	5 "
Water	1,000 c. c.

A process now being used in many places where a black and rust proof finish is desired is the Parker process, the principle of which was discovered by Coslett in 1907, later improved by Richards and Allen. Several different processes based on Coslett's original discovery have been in use but most of them depend upon the production of an insoluble phosphate on the surface of steel. In this process the cleaned articles are immersed in a weak solution of acid ferrous and ferric phosphate at 210° F. and kept there until action or gas bubbling ceases. The surface of the material is then a dark gray color or black depending on the polish or finish before treatment. This is improved by a dip or rub in different oils. This process is licensed to manufacturers and concentrated solutions of chemicals are furnished with directions for keeping up the tank strength. Success in the use of this process depends largely upon the preliminary treatment. The writer finds that on steel stampings a light sand blast after cleaning gives the best results; on forgings a finish with an abrasive of not more than 40 mesh and on hardened and very smoothly polished surfaces a sand rub. This last statement may seem absurd but after many weeks of experimenting on a very difficult problem in coloring by the Parker Process the sand rub was found to be the only method to put the surface of the article in question into a condition such that it could be colored. On small parts a tumble in sand is a good preliminary treatment.

COPPER OXIDIZED FINISH

There are in use now several methods which really do not alter the surface of the steel or iron but depend on the blackening of some other metal, generally copper and sometimes arsenic. These methods are satisfactory where extreme durability and corrosion resistance are not necessary. The articles can be copper plated or struck and immersed in either of the following copper oxidizing solutions until the proper color appears.

No. 1.

Potassium sulphide	1½ ounces
Ammonia	2 "
Water	1 gallon

No. 2.

White arsenic	2 ounces
Sodium cyanide	5 "
Water	1 gallon

Heat to boiling.

In the following process the work is heated to about 250° F. and brushed while hot with this solution:

Copper nitrate three parts.
Silver nitrate three parts.
Water three parts.

From this a deeper black can be obtained by dipping into a weak ammonium sulphide solution.

HEAT PROCESSES

Where only a thin surface color is desired such as on clock and indicator hands, some revolver parts, cutlery, etc., the heat bluing or tinting method is commonly used. There are many different ways of heating the work to produce the color. On small jobs a good way is to immerse the parts in a pan of charcoal and heat the pan until the tint appears. After the work is removed rub up with a light mineral oil. Wood ashes, Kieselguhr or any inert mineral filler does as well.

In the Carbonia process a black finish is produced by heating in a closed drum in the presence of ground bones and Carbonia oil.

The original Bower-Barff finish which consisted in heating the work at 1300°-1500° F. in the presence of steam has been improved by several different methods. In the Swan process a very fine rust resistant finish is produced by heating the articles in a muffle furnace using superheated steam and certain chemicals with a temperature of 1100° F. In the Bradley process a similar deposit is obtained by heating in a muffle in the presence of hydrogen and vaporized hydrocarbons. Many concerns have their own modifications of the Bower-Barff process, most of these being a method in which the articles are dipped in different solutions and then subjected to a high heat in a muffle furnace.

The processes where a high heat is used together with chemicals is to be preferred to the tinting methods as a very durable coating of oxide is generally produced. Where the heat tinting method is used it can be made to last longer by applying a coat of lacquer.

A blue-black is produced by dipping in a molten bath of potassium nitrate with the presence of about 2 per cent of black manganese dioxide. The temperature is between 700° and 800° F., depending upon the size of the work.

Small screws, nuts, bolts, etc., are oil blackened by packing in charcoal dust, heating to 1500° F. for one hour and then quenching in oil.

There is a demand for blacking articles which have been Sherardized or electro-galvanized. The writer finds if this class of work is treated with the following solution and then dipped in oil and the oil burnt off over an open flame a very durable deep black color results:

Double nickel salts	6 ounces
Antimony trichloride	2 "
Muriatic acid	1 "
Water	1 gallon

Where electroplating equipment is available black nickel deposits are very satisfactory on Sherardized and electro-galvanized material. Any of the various black nickel formulas will do, but the following has been found the best for this work:

Double nickel salts	8 ounces
Zinc sulphate	1½ "
Ammonium sulphocyanate	1¼ "
Ammonia	1 "
Water	1 gallon

ELECTROLYTIC METHODS

The electrolytic methods are usually open to the objection that they take too much time, equipment and more care must be used in the preparation of the surface. The tendency in concerns where electro-plating is not part of the production is to put the coloring in the hardening department and use some heat method or the Parker process.

There are countless formulas for producing a black finish on steel articles by hanging them as anodes or cathodes in solutions, but the most successful seem to be the black nickel methods.

COLORING COPPER.

Copper can be colored a variety of colors by immersing in a solution of hyposulphite of soda and lead acetate at a temperature of 180 degrees Fahrenheit. The solution is composed of the following materials:

Water	1 gallon
Sodium hyposulphite	6 to 8 ounces
Lead acetate	2 to 4 ounces

The colors change very rapidly when articles of copper or brass are immersed in the solution. C. H. P.

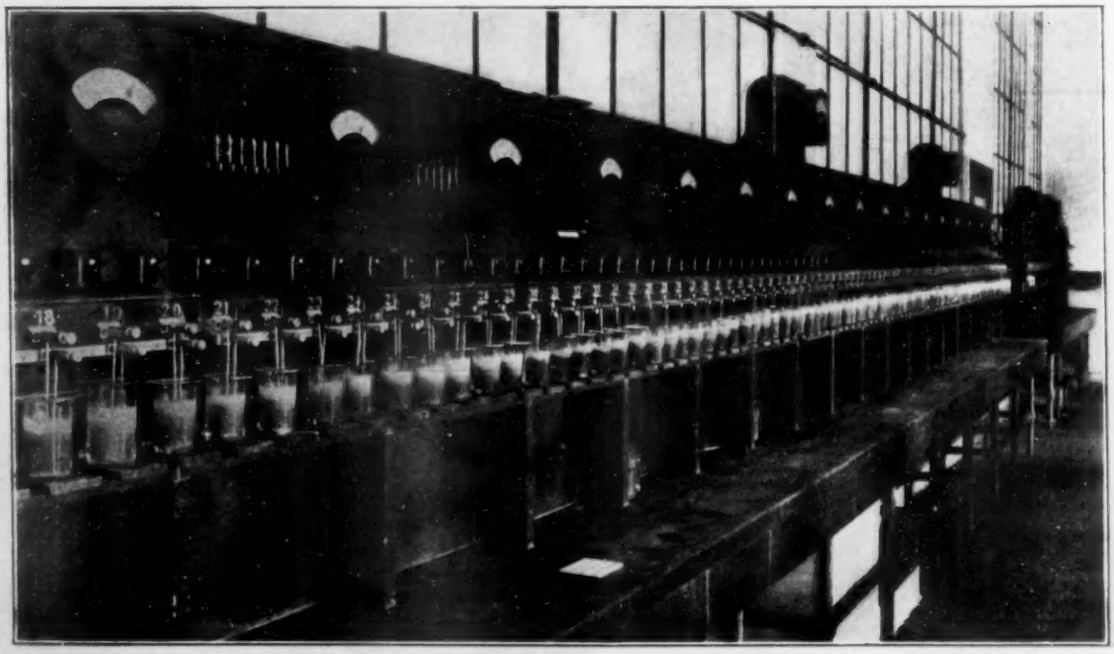
THE CHEMIST IN THE BRASS MILL

How the Scovill Manufacturing Company, Waterbury, Conn., Applies Chemistry to the Production of Metal.

The cuts on this page show in a graphic manner the development of chemistry in the brass business. It is only a few years ago that the work of the chemist in the manufacture of brass began to be appreciated to the extent that it was warranted. If pioneer chemists of the brass mills could be induced to tell their various stories of their struggles to show how vital their work was to the successful economical production of the product we are sure that all the stories would agree that the way was at no time an easy one.

As these pictures show, the importance of chemical analysis at the present time is fully realized by metal

CHEMICAL AND TESTING DEPARTMENT EMPLOYEES.

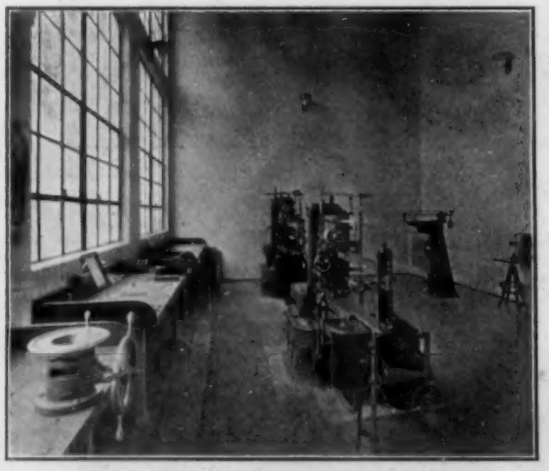


VIEW IN THE MAIN LABORATORY SHOWING ELECTROLYSIS BOARD.

manufacturers and in this particular instance it would seem that the Scovill Manufacturing Company of Waterbury, Conn., stands very high up if not at the head of the list, of those concerns who maintain chemical and metallurgical supervision for their metal plants.

As a recent bulletin issued by this company puts it: "The demands for analyses and test have grown so rapidly that it has forced the company to run a night and day shift. Even this expedient did not meet the requirements, so that it has been found necessary to develop new methods and to improve and add to equipment until to-day the laboratory has been brought to a very high standard and is humming with activity."

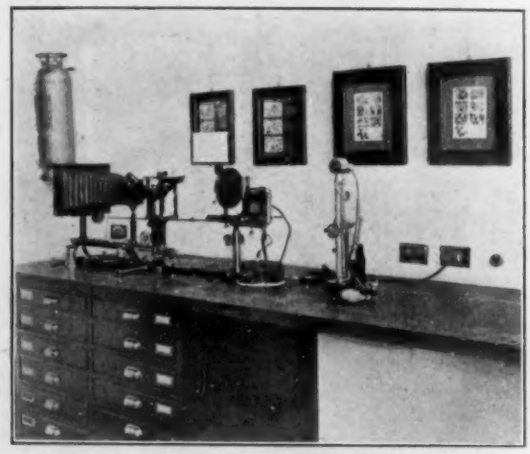
THE MAIN LABORATORY.



THE PHYSICAL TESTING ROOM.

THE BALANCE ROOM, WHERE ALL SAMPLES ARE WEIGHED.

THE METALLOGRAPHIC DEPARTMENT.



VIEW OF THE METALLOGRAPHIC DEPARTMENT, SHOWING MICROSCOPE.

William B. Price, the chief chemist, has been appointed as the representative of the American Institute of Metals on the Executive Committee, Engineering Division of the National Research Council, Council of National Defense. Mr. Price is now the senior vice-president of the Institute of Metals division of the American Institute of Mining Engineers.

WATERBURY SPELTER AVERAGES

	1914.	1915.	1916.	1917.	1918.
January	5.54	6.55	22.50	13.05	9.60
February	5.70	11.85	22.70	13.80	9.60
March	5.59	12.15	23.15	13.45	9.40
April	5.50	13.85	23.20	11.85	8.50
May	5.38	20.55	21.20	11.05	8.95
June	5.37	25.60	17.40	10.85	9.50
July	5.26	24.90	15.20	10.55	10.30
August	5.66	19.30	13.60	10.05	10.45
September	5.91	17.85	13.70	9.80	11.20
October	5.23	16.85	12.95	9.75	10.60
November	5.38	19.36	14.10	9.65	....
December	5.90	21.15	13.20	9.55	....
Average	5.53½	17.50	17.72	11.12	....

WATERBURY, CONN., THE BRASS CITY, FIGHTS THE INFLUENZA

How the Scovill Manufacturing Company Aided in the City-wide Campaign Against the Disease.

During the recent epidemic of influenza, with its accompanying scourge of pneumonia at Waterbury, Conn., the Scovill Manufacturing Company played a most important part. As is told by the *Waterbury Republican* the story is an interesting one. It so happened that at the time of the outbreak of the epidemic that the United States Public Health Service, Division of Occupational Diseases had been conducting investigations concerning the relation of sanitation and fatigue to the munitions output and health of munitions workers. This work is under the direction of Surgeon General Rupert Blue and under the direct supervision of Surgeon General Scheleschew. Concerning the relation of sanitation to the munitions output, searches are being conducted in Philadelphia, Pittsburg and New Haven, while Waterbury has been under investigation for some time regarding the corelation of fatigue with production.

The investigation which is in progress at the Scovill Manufacturing Company is under the direction of Dr. A. A. Ryan and Dr. P. S. Florence, of the United States Public Health Service, with a staff of ten assistants, including two public health nurses. Before coming to Waterbury, they completed reports at the Ford factory in Detroit and at several other important industrial plants.

The method of procedure in conducting the work includes an investigation of the different types of occupation from which workers are absent through illness. It was while engaged in reporting these absences and in looking up their causes, that the nurses of the Public Health staff began to report many absences which were not related to the fatigue problem and which, when followed up, were found to be caused by attacks of influenza. A thorough search was made into the manner in which the disease was depleting the ranks of workers and it was found that from 25 to 50 per cent of the employees of every factory in the city were absent from their work because of illness with influenza or fear of it.

COPING WITH THE SITUATION

Dr. Ryan was asked by the officials of the Scovill Manufacturing Company to suggest the best manner in which to cope with the situation and to render all the attention and help necessary to those afflicted. He outlined a plan which contemplated a survey of all the absences in the factory to estimate the severity of the illness in each case and to become familiar with the home conditions of each patient.

By means of the factory census cards, which indicated the type and amount of training for nursing which was possessed by every girl in the plant, it was possible to obtain the names of a large number of girls who had nursing experience and whose help would be needed to carry out the work of investigation and care. It was decided at the outset that even though the local profession could not render all the services required during the epidemic, the Scovill Manufacturing Company could not make medical calls. It could, however, use volunteers to do nursing under the supervision of the trained nurses on the staff of the factory accident hospital and the two Public Health nurses then at the factory. A call issued for girls with nursing experience resulted in the immediate response of 55 volunteers who formed the nucleus of the department which was to do survey and nursing work.

The next step was to organize an office force which would collect material, sort the cases and divide them into district groups, and record results. To organize this force by the quickest and most efficient methods, Clinton E. Woods, expert on accounting methods, was called into consultation at a conference held at The Elton,

TRANSFERRING INFLUENZA PATIENTS FROM HOME TO HOSPITAL DURING THE EPIDEMIC AT WATERBURY, CONN.

at which were present Mr. Wood, his assistants, W. H. Sandalls and Mr. Parton, and the Public Health officials, Dr. Ryan, his secretary, Miss Louise Eisenhardt, and Miss Elsie F. Smith and E. M. Marlin. At this meeting a complete office system was drawn up, form sheets prepared for survey and case records, nurses' visiting records, and food distribution. The following morning a large office with various departments was organized on the lower floor of the factory engine house.

EPIDEMIC SPREADS

While the emergency organization at the Scovill Manufacturing Company continued to discover new cases of the disease which needed attention, the city health department, the Associated Charities, the Visiting Nurses and private individuals were also continuing to discover that the epidemic was spreading through the city at an alarming rate.

Mayor William H. Sandland applied to Dr. John T. Black for advice and help and Dr. Black in turn called on the United States Public Health Service. Capt. W. F. Draper, who had been assisting in coping with the Boston epidemic, co-operated with the state health department by ordering Dr. P. F. Stewart to come to Waterbury and confer with the mayor. Through Dr. Black and Dr. Draper, the local officials of the Public Health department have been assisted in getting medical aid from other cities and have kept the state health department informed of conditions here by sending a report to Dr. Black each day.

After conferring with Dr. Draper the mayor called a conference of the heads of various philanthropic agencies and manufacturing concerns to decide how to best meet the situation. To this meeting were invited Dr. C. W. S. Frost, city health officer; John H. Goss, Rev. Charles A. Dinsmore, D. D.; Charles A. Templeton, Eugene Kerner Ralph E. Day, Henry B. Dow, John P. Dow, John P. Elton, F. S. Chase, Dr. A. A. Ryan, D. L. Summey, C. E. Woods and E. S. Hunt. Dr. Stewart and Dr. Ryan were called into conference and, since the Scovill plan was thoroughly organized and was being successfully carried out, it was suggested that an organization similar to this be put in operation to cover the entire city with the plan and personnel of the factory to be used as a nucleus for the larger work.

This suggestion met with the approval of those called into conference and on October 16 the mayor appointed an executive committee with John H. Goss as chairman. Dr. Ryan was placed in charge of the entire emergency organization as special health officer of the city. C. E. Wood was placed in charge of the departments of information, survey, routing and accounting; C. A. Templeton was appointed to take care of the supply department; Edwin S. Hunt was given charge of finances; Rev. Charles A. Dinsmore, of the Red Cross canteen service, and D. J. Lahey was made publicity agent.

SOME METAL STATISTICS

DATA GATHERED BY THE UNITED STATES GEOLOGICAL SURVEY.

BRASS EXPORTS FOR 1917.

Exports of brass and all other manufactures of brass for December, 1917, amounted to $4,732,664, against $26,451,997 for December, 1916, a decrease of $21,719,333. Twelve months' exports were $239,857,967 in 1917; $315,656,757 in 1916 and $54,841,444 in 1915.

Statistics follow:

	December		12 Months	
	1917	1916	1917	1916
Brass bars, pl. & sheets.	$2,077,588	$8,909,286	$101,486,423	$72,683,626
All oth. mfr..	2,259,209	17,399,425	131,942,058	241,668,081

For the calendar year 1917, exports of brass and manufactures show a decrease of 24 per cent. over the corresponding period of the previous year.

Monthly totals for the year follow:

	1917	1916	Changes
December	$4,732,664	$26,451,997	Dec. 21,719,333
November	3,954,640	25,846,879	Dec. 21,892,239
October	6,952,853	25,315,816	Dec. 18,362,963
September	6,680,756	33,051,564	Dec. 26,370,808
August	9,726,524	47,106,903	Dec. 37,380,379
July	12,619,616	30,327,885	Dec. 17,708,269
June	21,565,239	31,929,451	Dec. 10,364,212
May	26,869,030	29,476,168	Dec. 2,607,138
April	39,385,481	20,683,787	Inc. 18,701,694
March	42,216,166	27,726,470	Inc. 14,489,696
February	30,891,499	10,549,064	Inc. 20,342,435
January	34,263,456	7,190,773	Inc. 27,072,683
12 Months Total..	$239,857,967	$315,656,757	Dec. 75,798,790

For the twelve months ended December 31, 1917, 328,541,415 pounds of brass bars, plates and sheets were exported.

RECORD ALUMINUM OUTPUT IN 1917.

The output of aluminum in the United States in 1917 is put at 180,000,000 pounds in figures recently collected, the compilation being based on an actual output in 1916 of 139,000,000 pounds. In 1900 the output was only 7,150,000 pounds. The increase has been progressive nearly each year, since, the 10,000,000-pound mark having been passed in 1905 and 100,000,000 pounds practically reached in 1915 with an output of 99,806,000 pounds. All except the 1917 estimates are U. S. Geological Survey figures.

Imports of aluminum have correspondingly declined. Those for 1917 were only 1,904,000 pounds as compared with 13,765,000 pounds in 1915 and a maximum for the last 17 years of 26,958,000 pounds in 1913. In 1900 they were 365,000 pounds.

A National City Bank (New York) compilation puts the world's output in 1916 at 135,000 gross tons, against 91,100 tons in 1915 and 7,200 tons in 1900. The output has been progressive since 1900, the 1905 production having been 11,300 tons and the 1910 output 49,100 tons.

PRODUCTION OF SECONDARY ZINC IN 1917.

PREPARED FOR THE UNITED STATES GEOLOGICAL SURVEY BY J. P. DUNLOP

	Short tons
Zinc recovered by redistillation by regular smelting plants that also treat ores	8,519
Zinc recovered by redistillation by plans that treat only secondary material	8,316
Total redistilled	16,835
Zinc recovered by remelting, sweating, etc	14,565
Total zinc recovered as spelter	31,400
Zinc recovered in alloys other than brass	4,800
Zinc recovered in brass (estimated)	80,000
Total	116,200

EDITORIAL

Vol. 16 New York, November, 1918 No. 11

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW.
Published Monthly

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CONTENTS

HIGH FINANCE AND METALS

The recent appointment of a receiver for and the legal investigation of a large New England brass company has given rise to considerable speculation as to the internal causes for such action. The concern in question was organized to handle certain contracts for metal needed for war work. There not being at the time the contracts were acquired adequate sources of supply from which to obtain the necessary metal it was decided to purchase a plant already established. This was done and the company launched itself into the metal world practically over night. The authorized stock of the company was $600,000 first preferred, $400,000 second preferred and $3,000,000 common stock with a par value of $10. A statement of the standing of the company in the "United States Investor" says that there is none of the first preferred stock outstanding. The second preferred stock is said to be entitled to 8 per cent cumulative dividends. The first action of the company was to purchase a small New England plant for a sum stated by experts to be far in excess of its value. The second was to load up the pay roll with a staff of high priced officials no one of whom, it is stated, had had any previous experience in the manufacture of sheet brass. There was a president at $20,000 per year, a manager at $18,000, a treasurer at $5,000 and so on down the list.

After spending considerable money for new machinery and using up a lot of high priced time it was decided in about a year that more capacity was needed. Another mill was bought and as before, it is stated, a price was paid considerably in excess of the real value. In fact, the taxable value of the property is stated to be just about one-fifth of the price paid for it by the new company.

Now, being equipped with, as the printed matter stated, one of the finest establishments possible, the officials of this progressive concern, it is stated, proceeded to accept contracts from all comers without regard to producing costs, about which they evidently knew little or nothing and cared less. As a result is was only a short time before the company, as the receiver stated at the proceedings which followed, found itself losing money at the rate of $35,000 per month. In the court proceedings it was brought out that the company in about eighteen months had managed itself into the following position:

Liabilities	$3,922,994.04
Assets	$3,396,146.57
Deficit	$ 526,847.47

Under the assets there appears an item of $1,000,000 for "good will." Among the liabilities are found such items as $145,000 due on notes, $88,000 due the U. S. Government on excess profits! And, finally, $14,000 due to an electric power company for power!

It is easy to see from the foregoing that the officials of the new concern were adepts at high finance and from the testimony given at the bankruptcy hearings the causes of the failure are evident. The first was an exaggerated idea of the profits to be made in the manufacture of brass and this caused the granting of high salaries and the taking on of un-remunerative contracts. Second, unfamiliarity with the practical side of the business caused the loss of money when plants were operated under the direction of new management which had been successful under old. Here were two concerns that had been established for some years and both had won a name for themselves and a respected place among brass producers. Yet in the short space of eighteen months they are run on the rocks of bankruptcy by a new company formed for the express purpose of making them more profitable than ever before.

SHORTAGE OF BRASS

The extensive use of brass for the manufacture of war materials has resulted in a great scarcity of the metal. Of course, one of the dominating factors of the shortage is the difficulty experienced by the metal producers in operating their plants on a 100 per cent production basis. This is due in a large part to the scarcity of both skilled and unskilled labor. The war has taken a great many men and shipbuilding and other industries closely related operated on the "cost plus" plan have also drawn a great many from the brass producing centers. The influenza, which has swept the entire country, has also contributed largely to the decrease in production.

As an evidence of the shortage existing in brass, the recent order issued by the Priorities Division of the War Industries Board are interesting. To the gas range manufacturers the Division order says:

> "It appears that your industry uses considerable quantities of brass and copper and brass and copper products. It will be exceedingly difficult for your requirements of these commodities to be supplied and, for that reason, it will be advisable for you to review your requirements of these materials with great care and eliminate every use of them which can be eliminated.
>
> "Brass and copper tubing, in particular, will not, because of the war demands, be available to your industry for use in the manufacture of water heaters or other commodities. Such supplies of brass or copper tubing as your manufacturers may have on hand should be reserved for repairs and replacements in their products which are already in use.
>
> "This ruling may result in the shut-down of factories or departments using such materials, in which event the War Industries Board will extend any assistance within its power to aid any such factory or department to procure war work."
>
> The metal bed manufacturers are advised:
>
> "The materials which are used by your industry are of such importance, and the constantly increasing demand for them is so vast, that it is imperative that you should put forth every effort to avoid any unnecessary or wasteful use of such materials, and to encourage consumers and users of your product everywhere to utilize to the fullest extent during the period of the war stored, second hand, or temporarily discarded articles rather than purchase new ones."

The situation for the manufacturing jewelers who use brass in one form or another is equally critical. All the Connecticut manufacturers who have in the past furnished practically all of the metal consumed for this purpose in the East, under government orders, are refusing to sell brass to any one who has not a priority certificate. It has been very hard for jewelers to get brass for the past six months and orders placed fully that long ago are still unfilled. It has been suggested that the rolled plate manufacturers combine and establish a rolling mill and make their own brass. This plan, while appearing on the surface to be good, would meet with several serious objections. The casting and rolling of brass and copper products requires not only heavy and costly machinery but skilled help. Granting that machinery could be obtained (which is doubtful) where would the necessary labor come from? If the mills already established cannot get labor to operate at more than, in some cases, 40 per cent. capacity how would a new mill do it?

Then, too, in the face of the order from the War Industries Board we doubt very much if a license could be obtained to start the mill, and then to get the metals,—copper, zinc, lead and tin, out of which to manufacture the various alloys needed.

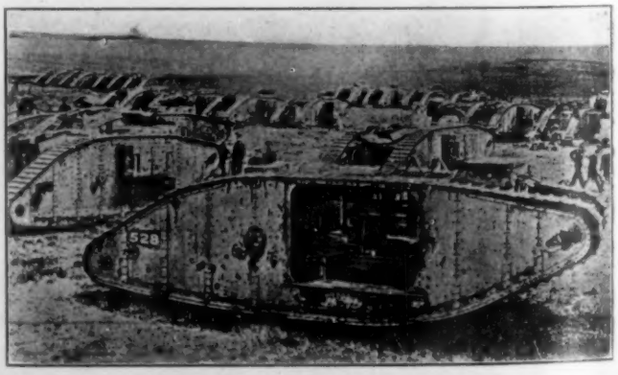
It seems to us that the better plan, which is already being followed by some manufacturers, is for all available plants to get busy on war work and help the country win the war rather than to attempt to continue to turn out articles of adornment, which are surely not essential at this time.

ALUMINUM SOLDER

The article on aluminum solder published in this issue of THE METAL INDUSTRY recalls to mind the early days of aluminum as a commercial metal. During the life of THE ALUMINUM WORLD, from September, 1894, to December, 1902, the search for a reliable aluminum solder went merrily on. As was told in the columns of THE ALUMINUM WORLD in those days there did not seem to be much promise that the problem of soldering aluminum would be satisfactorily solved. From the present status of the art some progress seems to have been made and therefore we believe the article here presented will prove of great value to all interested in the subject of soldering aluminum.

PEACE

As this issue of THE METAL INDUSTRY goes to press the news comes of the signing of an armistice in France that means peace to all the world. We have neither time nor space to dilate upon this wonderful news now; we will have to reserve things that we wish to say for a later issue. All we can do then is to express as fervently as possible the hope that peace, peace for evermore has come upon the earth!



A FLEET OF TANKS. SERGEANT HAAS ON THE OPPOSITE PAGE PLEADS FOR MORE OF THEM.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

A LETTER FROM FRANCE BY A FORMER ELECTRO-PLATER

To the Editor of THE METAL INDUSTRY:

This day, September 30, the first anniversary of my life in the army, makes me reflect upon the events that have passed. In health, there is little to be desired and as far as happiness I am as happy as one can be away from his people and friends. A year ago I gave very little thought to where I would be today and today hopes run high. With the reported success of the Allied armies on all battle fronts it is hardly possible that another year will pass and not find me numbered among my old friends. Indeed one cannot but have high hopes after passing through a most depressing and black spring and summer, when German success was at its height. But now night has passed, twilight has appeared and soon the sun will break out in all its radiance.

The eventful September 30, 1917, will be one day that will always be in my mind, with the great assemblage of drafted men and their friends bidding them good-bye. Then boarding the train at 34th street, Long Island, to go to Camp Upton. Here occurred an incident which was markedly different from one that I was to go through five months later. Freight yards and factories must have been notified to give us a send-off and they certainly did. It is almost impossible to describe the sensation and emotion,—one really has to go through the event to know.

The life at the camp was good and great, but to say that at times it was not trying would be a falsehood. It was hard for one who had been his own boss and did practically what he liked, to have restrictions placed upon him. It was also hard to obey and carry out certain orders at times, but they had to be done and the sooner they were the better one felt.

Then came a transfer which took me from Camp Upton to Philadelphia and subsequently to Camp Merritt, the embarkation camp, and once there you were doomed. At this latter camp one is expecting continually the orders that will carry you away. Once they have arrived you are waked up at three or four o'clock in the morning and under cover of darkness the march to the station commences. All one hears is the steady tramp of feet, all one sees is darkness and a seemingly endless mass of men. The train departs, eventually bringing you to a freight yard and here again you secretly board a ferry boat that is to take you to your transport. Once on board the transport, however, your feelings are somewhat relieved as you know you are on your way then.

The departure on the boat is very much different from the first trip to the camp. No one is allowed on deck and the boat pulls out quietly, there are no farewells and everyone tries to get at a port hole in order to keep in view the shores of New York and New Jersey as long as possible. Once upon the open sea one walks, drills, eats and sleeps with a life belt on or near him. The trip across is generally a happy-go-lucky one with singing, playing of cards and the "rolling of bones," unless a sobering incident occurs, such as the sinking of the *Tuscania* about which I have already written you. The sole desire from then on is to get some good solid "dirty" dirt under your feet.

Upon arriving in port there begins another period of expectancy and nightmare, of being marched from one camp to another, not knowing how long one is to remain, whether one has time to take a bath and change his ill-smelling and dirty clothes or having arrived at a camp whether he is to be permanently located at that camp or at least to remain for a few weeks. Relief is no name for it when one is finally located.

After having spent several months in France, travelled through some of the cities, talked with the people of various stations in life one cannot but feel impressed with their courage and the hardships they have gone through in contrast to what our people back home will have to suffer. The greatest that the people at home in America will probably feel is the loss of some member of the family or of close friends and the least will be the giving up of luxuries and comforts. But to lose dear ones, homes, comforts and to be in continual expectation of invasion all together, that is what the French have had to suffer and they have done it bravely.

The French people had never really seen an American, that is representative American. It is true that they had seen tourists and from observation of them, they had gained a false impression. To be an American was to be wealthy and here, I might state, that the boys in O. D. uniform suffered from that impression. As one would naturally expect a lot of Americans let loose in a strange country are fit subjects for criticism and analysis. In reality, from an American's point of view, the criticisms made by the French of the Americans are of small account. To understand the nature of such criticisms one must first understand the French. The French are a race of people who put beauty and aesthetics on a pedestal. If beauty and aesthetics are not natural, it is one's supreme duty to acquire them.

Conversation with various French people reveals the faults that they see in Americans. In the first place, they say Americans lack intelligence (?) or knowledge, not of the large things, but of the small things that go toward the completeness of life. Another most unjust criticism is that the Americans are slow of perception and understanding, because things have to be explained too fully with "pros" and "cons," before they understand what is meant. The Frenchman on the other hand needs but a word or a suggestion. How could it be otherwise among strangers whose mental thoughts and ideas are different? Americans could say the same of the French if they were let loose in as large numbers in the United States as our soldiers are in France.

The French state that the American's idea of music and art has been greatly neglected, and we are criticised for the joy we express when hearing "the most absurd air" (ragtime). It seems that we have been criminal in neglecting to learn the works and the names of the most prominent authors and painters.

We Americans are too stiff, too stern and we lack gracefulness. We also wear ill fitting clothes that do not hide our physical defects, but all these are small things. The French people like us anyway, they like the noise we make, and the "hell" we raise and in general the way we do and accomplish things. They admit that they are slow in doing things and that they would be better off had they more of our characteristics in taking chances and our method of accomplishing things. It has become quite well known that the American will stand for no opposition. Refuse a request of the Americans and they will go ahead any way.

The usual method in France to get a consent to build a railroad, etc., is to make out a request and this request goes through several offices and takes several months. Engineers have been known to finish a piece of construction and the request for the consent to build it will not be half way on its journey. How completely the Americans will not stand opposition is illustrated by the advancing troops. The French worship their ancient monuments, cathedrals, museums and bridges and to destroy them for any reason is a sacrilege. So when the French advance they will not destroy or shell a town with artillery fire to drive out the Germans, but the Americans have no such reverence for ancient places, their main purpose being to drive out the Germans and they do. The French consequently complain that the Americans are as destructive as the Germans, but when asked which is the better to leave the Huns in possessions of a town to be afterwards destroyed by them or to have the satisfaction of driving the Germans out and killing some of them in the bargain, they will shrug their shoulders and say "you Americans now own France."

I am also sending you a picture postal card which speaks for itself. I might add that the more of these tanks there are the easier will it be to break through the Hindenburg fences and the more U. S. Boys will come home alive.

SERGEANT JOSEPH HAAS.
Medical Department Repair Shop No. 1.
Post Office No. 702. FRANCE, September 30, 1918.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

ALLOYING

Q.—Please give formula for a really good white metal for making ships' cabin fittings, etc.—one that will polish up well and be free from blowholes.

A.—There is a wide range of nickel brass alloys for this class of work, but a suitable alloy may be chosen from the following range:

Copper.	Nickel.	Zinc.	Lead.
48	15 to 24	25 to 32	3 to 5

A cheaper allow would be:

Copper	57 per cent.
Nickel	10 "
Zinc	30 "
Lead	3 "

The copper and nickel should be first melted together in graphite crucible, an addition of borax and of cupro-manganese (1 per cent.) being made before adding the zinc and lead. The borax should be added when the copper and nickel go into the crucible together with charcoal. Lead may be omitted if desired, but it assists machining operations.

An alloy known as white brass is as follows (it is easier to produce):

Copper.	Tin.	Zinc.
3 to 6	65	28 to 30

—W. T. F. Problem 2,633.

CASTING

Q.—I have a Government order for regulator valves weighing 50 to 70 pounds. They are to be made from manganese bronze and must stand 600 pounds water pressure. I am using a mixture of 56 copper, 36 zinc, 6 manganese copper, 1 tin and 1 aluminum. The castings are porous and crack. Could you advise me as to the correct mixture and how to handle it?

A.—You are advised to use "hydraulic metal" for these castings. The mixture is as follows:

Copper	100
Tin	10
Yellow brass sheet	25

Melt together and cast into ingots, then remelt and pour the castings. When a supply of gates, scrap, etc., is at hand, the remelting operation may be omitted as unnecessary. Castings made from this mixture will stand 2,000 pounds water pressure without leaking. Manganese bronze is not suitable for making castings that are to be subjected to water pressure. It contains aluminum, and this oxidizes to alumina, which remains suspended in the metal and causes minute porous spots that produce leaks. Where recoil cylinders for gun mounts are required to be made from manganese bronze it is often necessary to treat them with shellac to stop the leaks. If manganese bronze is insisted upon, the best that can be done is to buy virgin manganese bronze ingot from a reliable maker and use the greatest care in melting it and in making the molds. The use of return skim gates is also recommended to remove the alumina and dross that is always present in manganese bronze castings.—J. L. J. Problem 2,634

CLEANING

Q.—Could you suggest the use of a chemical for the removal of roughness from the surface of cast Muntz metal? We have tried a mixture of borax and cryolite, but without much success, owing to the shape of our molds.

A.—The only thing that we can advise as to the removal of roughness from the surface of the cast Muntz metal is to have the mold in which the casting is made thoroughly clean and smooth; that is, if the metal is poured into a closed mold.

If, however, it is poured into an open mold, as in making a large cake, if the surface of the metal just before it settles is squared off with a straight-edged stick, and a little cryolite having been previously put in the bottom of the mold, we see no reason why you should not have a smooth surface.

We know that some of the mills plane off the tops of these large cakes.—K. Problem 2,635.

FINISHING

Q.—What is the solution that is used for obtaining a black finish on steel for marking purposes in place of copper?

A.—In order to produce a black coating on steel for the purpose you mention we would suggest that you use the following solution:

Water	1 quart
Bismuth chloride	1 ounce
Mercury bichloride	2 ounces
Copper chloride	1 ounce
Hydrochloric acid	6 ounces
Denatured alcohol	5 ounces
Temperature	120 degrees Fahr.

The steel should be clean and heated to a temperature of about 212 degrees Fahr. Apply the solution with a swab or brush to the steel. A thin coat is all that is required. An intense black can be procured if a little linseed oil is applied to the black coating.—C. H. P. Problem 2,636.

FLUXING

Q.—We have recently installed a new furnace which is both a revolving and a tilting furnace. We are operating same with oil, it being an open flame furnace. We have trouble with slag and would ask you to advise us if possible what kind of a flux we could use which would melt at a lower temperature than yellow brass so that we could keep the metal covered with a light coating of flux while bringing it to the proper heat for pouring.

A.—A mixture of equal parts of lime and flour-spar makes a good flux for an open flame furnace. The two materials should be ground together in a ball mill or suitable crusher. About two shovels full of the mixture is sufficient for a charge of 500 pounds of brass.

Very often slag trouble is due to an excess of air. The brass is oxidized and the copper oxide, zinc oxide, etc., unite with the furnace lining to form silicates or slag. Hence, a neutral or slightly oxidizing flame should be used, in other words, perfect combustion should be secured. Black smoke shows too little air, a waste of fuel and an absorption by the metal of hydrogen or hybrocarbons that will give blowy castings. Drossy metal and dirty castings show too much air and sonsequent oxidation of the brass. To much care cannot be taken in lining an open flame furnace. If the joints are poorly made, the clay will slag away and the bricks get loose and fall out. The bricks should be rubbed together to a fit and very little clay used. This will also prevent any metal from penetrating the lining.—J. L. J. Problem 2,637.

MELTING

Q.—We shall be glad to know why melting pots for lead, tin, and zinc alloys are not run off by a tap from the bottom instead of being ladled out from the top? Is it because the pressure of the metal is so great in the pot that it cannot be controlled by a tap?

A.—The reasons such pots are not controlled by a tap at the bottom are:

(*a*) Tapholes of the ordinary clay-plugger type are too risky to adopt, owing to the danger of a break-out.

(*b*) Such tapholes would be difficult to use in such a way that the delivery of metal would be under perfect control.

(*c*) Ordinary metal taps attached to iron pots would not be practicable to use, owing to the certanty of fluid metal freezing and clogging up the working parts.—W. T. F. Problem 2,638.

MOTTLING

Q.—How can we produce the mottle blue finish such as is seen on the better makes of rifles and revolvers?

A.—The mottled finish on steel can be produced by heating a mixture of cyanide, such as is used for case hardening, in an iron kettle to about 1450 degrees Fahr. Immerse the cleansed and dry steel articles in the molten mixture until they become cherry red, then remove at once, otherwise the carbon will penetrate into the steel and give a case hardened surface. All that is required is a clean surface free from oxidation and as soon as the cherry red heat is reached immerse the articles in a quenching solution, consisting of one gallon of water and two ounces of potassium nitrate. The quenching water should be agitated either mechanically or by compressed air as the agitation produces a more distinct mottled effect than if the quenching water was not agitated.

After mottling an oil such as linseed oil or a mixture of linseed oil and paraffin should be applied as a protective coating and to bring out the mottled finish more distinctly.—C. H. P. Problem 2,639.

OXIDIZING

Q.—We shall be glad if you will inform us as to the best method for oxidizing (black) brass and gun-metal finished goods.

A.—It would be better to give the articles a deposit of copper—say twenty minutes or less, according to result, in the cyanide of copper solution. Then swill and immerse them until the desired shade is obtained in a solution of ammonium sulphide, or potassium sulphide, in the following proportions: 20 volumes of water to 1 volume of ammonium sulphide. It can be used warm, is cheap, and can be made up new. Scratch brushing gives the desired lustre, and lacquering must be effected if results are to be permanent or durable.—G. L. Problem 2,640.

REDUCING

Q.—Can you give us some information in regards to reducing lead battery plates?

A.—The formula used for reducing the lead sulphate and oxide, consists as follows:—

Coal	3-Parts by weight
Glass	6-Parts by weight
Salt	3-Parts by weight
Fine iron scrap	10-Parts by weight

This flux is thoroughly mixed with an equal weight of the grid filling which consists of lead sulphate and oxide. The iron scrap is necessary in order to decompose the sulphur in the lead sulphate. This sulphur is eliminated as sulphurous acid fumes or sulphur dioxide.

The main complication is in getting the full yield from the lead sulphate as it has a great tendency to go into the slag.

A very highly sulphated grid filling might frequently require as much as six parts of coal instead of three parts as given above in order to be assured of getting all of the lead out of the lead sulphate.

The filling of the grid should be thoroughly mixed with the flux before melting, the slag removed from each melt can be used over and over again instead of the glass in the above formula.

The temperature of the furnace should not exceed 1500 degrees Fahrenheit and should exceed 1,000 F.

The glass is the flux used for purifiying, iron scrap is the agent for reducing the lead to the metal and to take care of the sulphur, the salt acts as a cover to prevent the volatilization and the coal is the reducing agent.—H. H. S. Problem 2,641.

REFINING

Q.—In refining some gold, my melter had the misfortune of spilling about 5 ounces of the fine gold consisting of the mud-like remains after taking the silver and copper out with nitric acid. It was spilled on the furnace stand in this way: After the acid had ceased to act on the gold, it was washed several times and was being dried by the aid of heat when it exploded breaking the bowl and scattering all over. This, it seems to me, would indicate that there was chloride of gold present.

Kindly advise me how I can melt the product of the above in an economical manner in a small jeweler's furnace, using 4-inch sand crucibles. The stuff now consists of a lot of sand, fire clay and iron rust besides the content of gold, making a total amount of about one pint. Can I bring it down with fluxes?

A.—The best method of handling this material would probably be to follow the method used for "sweeps," viz.: Grind the stuff with a quantity of mercury in a small edge mill, or if this is not available, use a large iron mortar. The amalgam separated by washing is distilled in a cast iron retort. The mercury volatilizes and the gold remains in the retort.

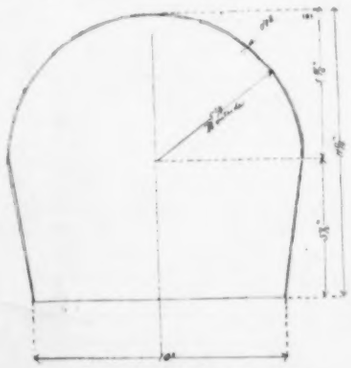
If you tried to use sand crucibles for fluxing off this large amount of sand, fire clay and iron rust and collect the gold in a lead silver button, you would have trouble from crucible breakage. Even black lead crucibles are not much better than sand crucibles at the present time.

It would be well to look further into the cause of the explosion in order to prevent its reoccurrence. Gold fulminate is very explosive when dry and it requires ammonia or potash for its formation. Gold carbide formed by passing acetylene into aurous thiosulphate is also very explosive when dry. By considering the possibility of the presence of these or similar reagents you may avoid future trouble.—J. L. J. Problem 2,642.

SPINNING

Q.—I have a large number of shells of .040 inch copper to spin up as shown in the accompanying sketch. Will you advise me whether a blank 22⅝ inches is big enough. I intend to order blanks 24 inches to allow margin for trimming.

A.—I should say that a 20-inch blank would be amply big enough, but much depends upon the method of spinning. The blank should be heavy enough so that semi-circular part could be spun on a hollow chuck out of its own diameter leaving only the parallel sides or cylindrical portion to figure on, but of course if the blank is of the same thickness as the finished shell is to be then it would have to be about 25½ inches.



A COPPER SHELL TO SPIN

In my experiments I have produced two shells, 24 inches in diameter, 14 inches deep, one from a blank 20 inches in diameter and the other from a blank 36 inches in diameter. These are extremes and neither are economical and only useful in the case of the heavy blank when a thick rub was required in a certain position, but I mention the fact to show that much depends upon the method of procedure and before giving an order for the blanks the workman should be consulted.

The allowance for trimming is abnormal, a blank of this size should not lose more than 6 to 8 ounces in trimming.—J. J. P. Problem 2,643.

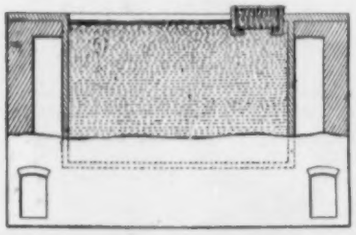
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

The age of these patent notices is due to the delay in the issuing of patent reports.—Ed.

1,276,977. August 27, 1918. **Method of Coating Metals.** R. J. Shoemaker, Topeka, Kansas.

This invention relates to the art of coating or plating metal articles with a metal of a different kind, and the object of the invention is to provide certain improvements, as shown in cut, in this art whereby the operation in question is performed more economically, conveniently and efficiently than has been possible heretofore.

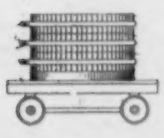


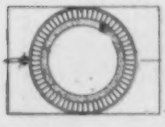
A more specific object of the invention is to improve upon the method of lead-plating metal articles disclosed in the patest to McClintock and Shoemaker, No. 1,195,376, patented August 22, 1916.

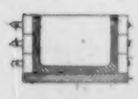
In employing the process described in the above mentioned patent in the lead-plating of boiler flues and other articles, the inventor made the discovery that if, instead of using zinc chlorid alone as a flux, a certain amount of common salt (sodium chlorid) is mixed with the zinc chlorid, a flux is obtained which has a melting point approximately fifty to seventy degrees Fahrenheit lower than a flux composed of pure zinc chlorid. The fact that these two salts, when mixed and subjected to heat, have a lower melting point than either of them alone (the melting point of zinc chlorid is about 540 degrees Fahrenheit and the melting point of common salt about 1500 degrees Fahrenheit) is of considerable importance in the matter of the choice of a flux for the treatment of the metal article preliminary to submerging in the bath of plating metal, in a process, such as that disclosed in the patent, where the flux floats on the bath of plating metal.

1,277,032. August 27, 1918. **Crucible.** John J. Boericke, Merion, Pa.

This invention relates to refractory crucibles for use in carrying out metal reduction and related metal founding processes, and it has for its primary objects the provision of an improved separable crucible of simple and economical construction, the parts of which may be readily assembled and separated to remove the contents.





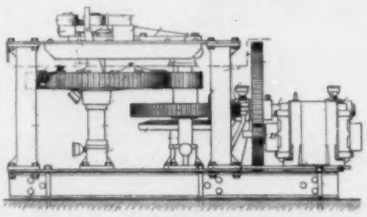


In conjunction with the foregoing, the invention also contemplates the provision of a refractory lining which will withstand high temperatures without disintegration, but which will readily break down when the parts of the crucible are separated.

After the parts of the crucible have been assembled, it is desirable to provide a refractory lining, as shown in cut, not only to prevent waste, but also to prevent the metal from adhering to the bricks, which would prevent the separation of the rings. To accomplish this, the refractory lining should be capable of withstanding high temperatures without disintegrating, and must at the same time be capable of being easily broken down when the rings are successively lifted off. In other words, the lining is a temporary, destructible one, sufficiently cohesive and refractory to withstand, for example, a metal reduction operation or some similar metallurgical or metal founding operation.

1,277,234. August 27, 1918. **Machine for Bending Metal Bars.** M. H. McKenna, Cleveland, Ohio.

This invention relates to machines for bending metal, and especially metal bars of that type employing a bed or table on which the work is held, and a pivoted bender which by its turn bends the metal around suitable formers to give the desired angle.



The object of the invention is to improve the means for operating a pivoted bender, said means including a shaft, and a clutch-device which is controlled by hand to operate the shaft and automatically released at the end of the stroke.

A further object of the invention is to improve the particular formers and the devices employed in the machine, as shown in cut.

1,277,761. September 3, 1918. **Bronzing or Coloring of Metallic Surfaces.** Qiurino Sestini and Tito Bondelli of Bergamo, Italy.

This invention relates to "bronzing" or coloring metallic surfaces, its object being to provide, among other things, a process whereby metallic surfaces can be "bronzed" or colored both rapidly and with a finish that is adherent, durable and fine. Further it affords a choice in the kind of color produced on the surface.

According to the present invention a surface is "bronzed" or colored by depositing copper or iron electrolytically thereon and subsequently "oxidizing" the said deposited metal; by "oxidizing" is meant not merely the production of a simple oxid but the production of any compound obtained by a process which in the broadest chemical sense may be described as an "oxidizing" process.

The bath employed according to this invention is preferably a hot dense alkaline solution containing an oxid either of copper or of iron combined with an oxid of the alkaline metal present; and the "bronzing" or coloring is conveniently effected by first electrolytically depositing the iron or copper on the surface to be treated in a bath of the kind just stated and subsequently coloring the said deposit by reversing the current.

1,277,989. September 3, 1918. **Alloy.** Foster Milliken, Lawrence, New York.

This invention relates to an alloy of a number of different metals, and, when cast, is black or very dark in color. An object of the invention is to produce an alloy which is non-corrosive, which is capable of being polished and which will not require cleaning.

The alloy contains the following metals in substantially the following proportions:

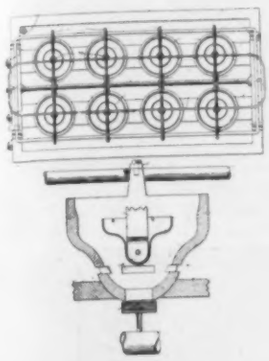
Copper	60-70%
Nickel	6- 9%
Iron	4- 6%
Zinc	12-16%
Lead	2- 3%

Trace of phosphorus.

The alloy is immune to corrosion. Tests performed with the alloy, by subjecting it to a solution of sulfuric acid consisting of 50% of sulfuric acid, maximum strength, and 50% of water, did not affect the alloy. It was subjected to a heavy brine solution, as well as to a light brine solution, with no effect whatever upon the alloy. Weather tests upon the alloy show that there is no corrosive action on the material. Valves made from the alloy have been subjected to a pressure of 300 pounds per square inch without any sign of the material leaving.

1,280,213. October 1, 1918. **Method of and Apparatus for Electro-Plating.** Clarence Albert Hach, of Oak Park, Illinois, assignor to Western Electric Company, Incorporated, of New York, N. Y., a corporation of New York.

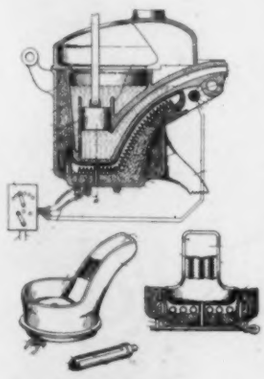
This invention relates to an improved method of and apparatus for electro-plating, and more particularly to a method of and apparatus for increasing the speed and efficiency with which the plating operation can be performed.



This invention contemplates an improved method of and apparatus for rapidly removing hydrogen bubbles, which makes it possible to use higher current densities and thereby to increase the speed of plating without pitting. In the preferred form of the invention herein illustrated these hydrogen bubbles are carried away by air liberated in the form of small bubbles directly under the article that is being plated, said air bubbles constituting a continuous stream, which bombard the surface of the article and carry with them as they rise to the surface of the plating solution the hydrogen bubbles which are being generated at the surface of the article and tend to adhere to said surface.

1,279,682. September 24, 1918. **Heating Device for Metal-Melting Crucibles.** George L. Fort, of Kansas City, Missouri, assignor to Fort-ified Manufacturing Company, of Kansas City, Missouri.

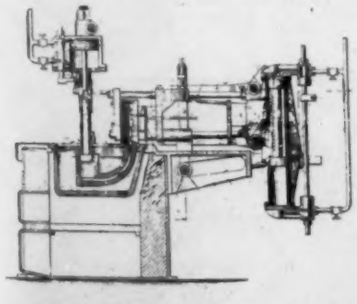
This invention relates to heating devices for metal melting pots such as are used in linotype, and like machines, for supplying molten metal to the type molds, the principal object of the invention being to provide an electrical device of this character as shown in cut, whereby heat may be applied to the crucible and along the delivery spout so as to readily melt the metal and insure a free flow of metal from the crucible to the molds.



A further object of the invention is to so construct the device that it may be used interchangeably with gas, gasolene or other heaters, such as are ordinarily used with pots of this character, without necessitating any change in the usual construction of the crucible.

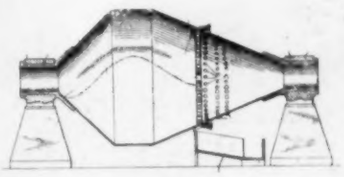
1,279,249. September 17, 1918. **Casting Apparatus.** George Waldemar Bungay, of Brooklyn, New York, assignor to Acme Die Casting Corporation, a corporation of New York.

This invention relates to improvements in casting apparatus and more particularly relates to that kind of casting apparatus used in making what are commonly known as "die castings." An object of the invention is to provide for forcing the molten metal into the molds under pressure with the greater number or all of the working parts operated by fluid pressure instead of by hand or other means. Another object is to provide for operation at high speed with safety to the operator. Another object is to obviate the necessity of cutting the sprue while the casting is in the mold. Another object is to minimize the length of the neck between the nozzle and the interior of the die so that the amount of air to be expelled from the die will be reduced to a minimum thereby reducing the likelihood of blow holes in the casting and thereby increasing the quality of the casting. In other words the object is the production of a mechanically simple and strong machine, as shown in cut, which will perform the operations reliably, safely, successfully and quickly with a minimum of human attendance.



1,279,335. September 17, 1918. **Conical Mill.** Harry W. Hardinge, New York, N. Y.

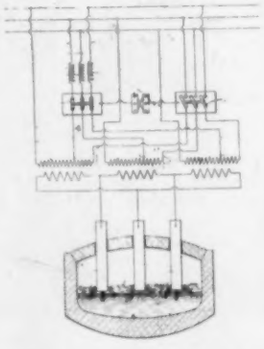
The invention which constitutes the subject matter of this application relates to an improvement in conical mills, the latter consisting, in its most common form, of cones arranged base to base (preferably with a cylindrical section between the two) and having an inlet opening at the apex of one cone and an outlet opening, at the apex of the other. It is with a mill of this type that my improvements are incorporated.



The drawing represents a longitudinal section of a conical mill, and illustrates in detail the screen employed. The distinguishing structural characteristic of all conical mills is the tapering shape of the portion (which may be conveniently referred to as the outlet portion) next to the axial outlet opening. This tapering form causes the material in the outlet portion to assume a sort of vertical stratification according to size, the largest pieces being at the plane of greatest diameter and the pieces diminishing in size toward the outlet, as fully described in Patent No. 908,861.

1,278,635. September 10, 1918. **Electric Furnace and Method of Supplying Current Thereto.** James H. Gray, of New York, N. Y.

This invention relates to electric furnaces and more particularly to the method and means as shown in cut, of controlling and supplying the current and preventing excessive surges in the fluctuations of the current and interruption of the arc during the melting down period.



In electric furnaces for melting down and refining metals by the utilization of heat from electric arcs it is desirable to employ a different E. M. F. during the melting period from that used during the refining and finishing period. During the finishing period the metal is in the form of a molten bath covered with molten slag and at this time it is desirable to use short arcs to prevent an excessive amount of heat which would in a short time destroy the side walls and roof of the furnace.

The invention provides for the utilization of a relatively high E. M. F. and long arc during the melting down period and a lower E. M. F. and shorter arc during the refining or finishing period, and the introduction of reactance in the primary circuit during the former period to prevent excessive surges on the line and the consequent interruption of the arc.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

THE CONSERVATION OF TIN

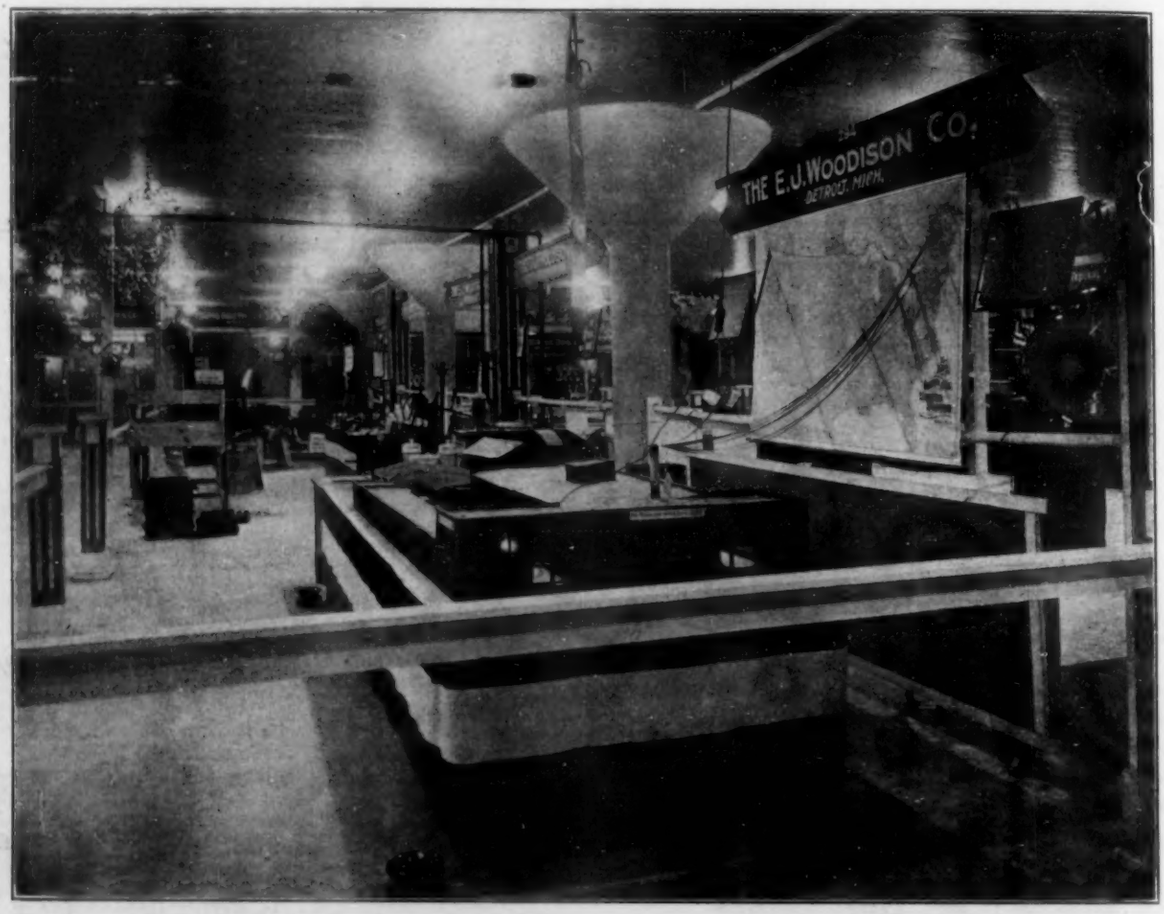
By H. P. WHITE*

Since the beginning of the present war many circumstances have occurred having a tendency to curtail America's supply of tin, while at the same time conditions due to the same cause have operated to steadily increase the demand for tin in this country; and in May of the present year the tin situation in this country had reached such a point that George Armsby, Chief of the Tin Section, War Industries Board, issued a circular letter in which the following paragraph appeared.

"On account of the limited supply of tin available in the world today, and because of the hazard involved in connection with our oversea imports upon which we depend for our requirements, and furthermore, because our war program calls for a very large tonnage of tin, it is imperative that we take immediate steps to husband our resources: First, by eliminating all waste; second, by substituting other metals wherever practicable; third, by reducing the percentage of tin used in various alloys just as far as possible, and, finally, by recovering larger quantities."

This request, on the part of the Government, for the conservation of tin to the fullest extent possible and in every possible manner, including the substituting of other metals wherever possible, was well received and acted upon by a great majority of the consumers of tin; and there is no doubt but that the results obtained from the experimental work, which has developed from the Government's request for the conservation of tin, are in many instances of great practical value; and will doubtless be so considered and retained in general practice after the supply of tin and its price returns to the level they occupied before the war.

Naturally, each manufacturer sought a means of conserving tin applicable to his own field of industry; and there is little of interest that could be said with reference to the elimination of



BOOTH OF THE E. J. WOODISON COMPANY, DETROIT, MICH., AT MILWAUKEE CONVENTION, OCTOBER 7 TO 11, 1918.

The reproduction of the plant is made from cores, made from Wood-Seed oil and built to a scale of 1/30 inch. The ribbons leading down from the map to the chimney of the plant represent the various branches of the company, including Montreal, Toronto, Buffalo, Cleveland, St. Louis and Seattle. These are, of course, all branches with stock. The exhibit, in addition to covering general line of foundry supplies, featured the Morrison Electric Jar Draw Pattern Roll-Over Folding Machine, the Woodison-Swan Hand Jar Roll-Over Core Machine, the Woodison-Universal Jar Core Box Machine, the Woodison-Tepper Roll-Over Jar Core Box Machine and the Woodison-Webb Air Squeezer.

*President New Era Manufacturing Company, Kalamazoo, Mich.

waste, the slighting of alloys by reducing the amount of tin required without providing a proper substitute, nor regarding the general methods of reclaiming; but interest naturally centers on the practice of substituting other metals or alloys for tin; the metals and alloys that may be substituted, and the amounts to be substituted in the different fields and departments of practice.

Others may mention a larger list of practical substitutes, as the writer has not unlimited knowledge of the tests that have been made nor the results obtained; but magnesium, aluminum, antimony, cadmium, and metallic phosphoro are each practical substitutes for tin in some of the innumerable departments in which tin is used, but none of them will take the place of tin in a general sense; that is, none of them can safely be wholly substituted for tin, but a certain percent of the tin specified in any formula may be substituted by some one of them; but no one of them can safely be used in all varieties of formulas, as each has its special field of usefulness.

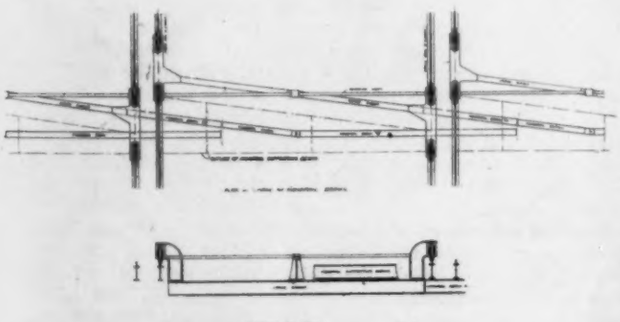
Magnesium, aluminum, antimony, and cadmium, each in its elemental form may be employed as a partial substitute for tin in certain mixtures. Their principle field for such use is, magnesium and antimony, babbitts; aluminum, composition bronze formulas; cadmium and solders.

Metallic phosphoro is an alloy marketed by the New Era Manufacturing Company, Inc., of Kalamazoo, Mich. This alloy has been employed as a partial substitute for tin for over seventeen years. It is used as a tin substitute in tin bronze, phosphor bronze, manganese bronze, composition bronze, both white and yellow, brass, and babbitts.

There is no doubt but that a proper use of the tin-substitutes will produce satisfactory results in a majority of metallic alloys, and it is claimed that in some cases they produce superior results; but to what extent the Government has investigated this subject, or to what extent they advise or permit the use of tin-substitutes in Government bronze, brass, babbitt, and solder is not generally known; therefore, parties engaged in the manufacture of such supplies, for the Government, should make direct inquiry through the department having charge of the line in which they are interested, and thus secure reliable information and instructions regarding the use of the tin-substitutes.

SKEW CRANES FOR FOUNDRIES

Patents have recently been issued to H. M. Lane of Detroit, Mich., covering a system which he calls skew cranes suitable for use in foundries and other industrial plants. This consists of a loop of monorail in front of the cupolas. Along one side of the foundry there is a straight run of monorail with switches turning in to most of the bays. On this monorail the usual hand pushed trolleys are employed. The details of these diagonal



PLAN OF SKEW CRANE.

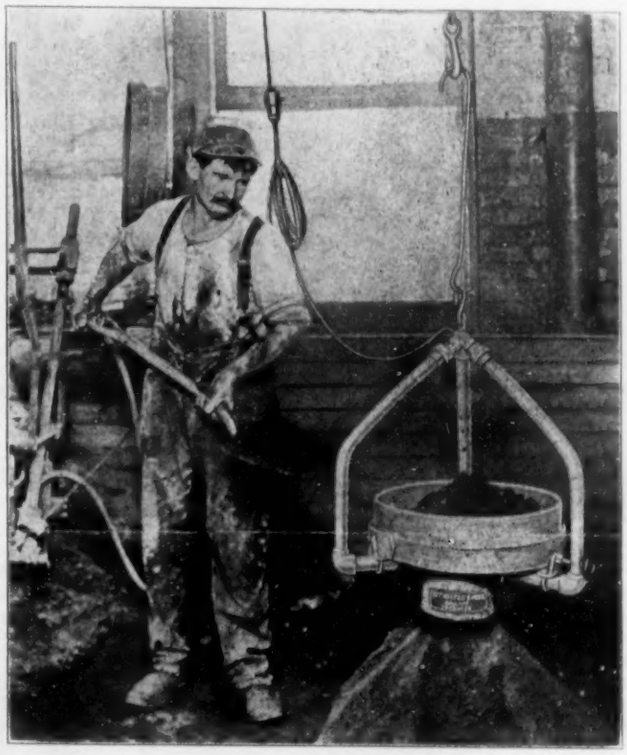
cranes are shown in the cut. In the upper portion of the figure it will be noticed that when the monorail switch is thrown, the trolley runs on to a short beam marked A, and from this on to the depressed or supported girder of the skew crane. The end supports for this crane consist of steel castings to which the crane beam itself is attached. There is a squaring shaft which extends from one front wheel to the opposite rear wheel, and this construction makes it possible to put a bearing for the squaring shaft on the middle of the crane girder. The outline of the steel frame work which supports the switch is shown by dotted lines, the beams themselves having been left off so as not to complicate the switch system. In the case of a 20-foot span the beam has to be skewed a little more than two feet. This offset and the fact that the advanced wheel on the back side of the crane leads well in front of the beam makes it impossible to run the crane beam tight against the wall, but as a rule the space for three feet against the wall is not used as molding space, and hence the floor is as efficiently covered as it would be with any other type of crane.

In operation the molding machines are placed at the back of the bays and the molds set forward with the cranes as they are made. The cores are brought from the coreroom on a rack or large box, transferred to the skew crane, and set next to the molding machine, or at any part of the floor where it is most convenient for pouring the molds. When pouring time comes, in the case of light work, ordinary Brillion system ladles can be used. In the case of heavier work regular bull ladles or geared ladles can be used. In the case of brass, bronze or aluminum foundries the original melting pot can be brought to the floor, or the metal can be transferred to a heated ladle and brought to the floor.

After pouring the crane can be used for shaking out if desired, and then the castings can be piled into boxes or tubs and taken direct to the cleaning room.

ELECTRIC SAND SIFTER

The sand sifter shown in the cut is known as the Sandhog and manufactured by the Schroeter Engineering Company, Chicago, Ill., and is claimed by them to be typical of its name.



THE ELECTRIC SAND SIFTER.

The gyratory motion of the motor, which is suspended below the riddle, creates a regular whirlpool of sand inside of it, throwing the sand with centrifugal force toward the rim. Three horizontal supporting members of pipe and the hollow frame circulate the air and conduct the heat away from the motor, which is furthermore cooled by the running sand. Owing to these novel features the Sandhog, the manufacturers state, can be made to work overtime and actually "eats it alive."

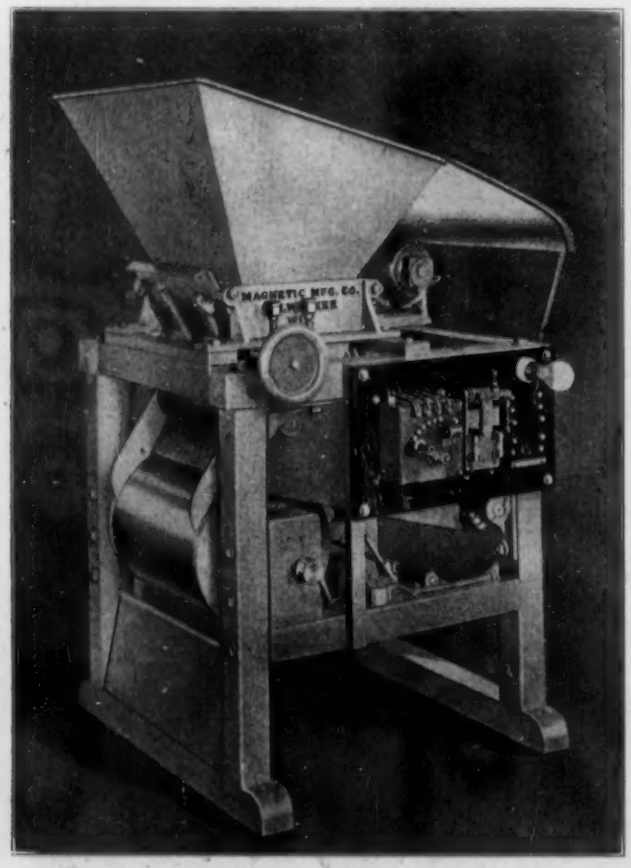
The frame is adjustable for all standard size riddles, which can be adjusted or removed by the operation of one thumbscrew. The complete sifter weighs about 35 pounds and for size is justly called a "vest-pocket edition" but for work it is a "little giant."

The Sandhog is arranged for lamp socket connection and requires approximately one ampere of either D. C. or Standard 60 cycle A. C. current at 110 or 220 volts.

This sifter attracted considerable attention at the exhibition of foundry supplies and apparatus held at Milwaukee, Wis., October 7 to 11, 1918.

MOTOR DRIVEN MAGNETIC SEPARATOR

The machine shown in the cut is type "L," magnetic separator manufactured by the Magnetic Manufacturing Company, Milwaukee, Wis. This separator has a frame of hardwood



MOTOR DRIVEN MAGNETIC SEPARATOR.

thoroughly filled and painted. It is rigidly constructed, having mortised and tenoned joints, with ½ inch joint bolts and heavy cast iron corner brackets, making a handsome and massive frame. The wood frame prevents losses by leaks in the magnetic field. It has no shaking conveyor, high speed shaft or eccentric bearing. The machine is driven from one common shaft, using two small chain belts, one operating the feeding device and the other, the separator cylinder. The bearings are lubricated by compression grease cups which are all readily accessible.

The only adjustment to be made on this separator is in the hopper slide for regulating the feed. The standard type "L" machines may be used on either 110 or 220 volts direct current. The change from one voltage to another is simply a matter of changing two connections on the face of the switch panel. The machine is also wound for special voltages if so desired.

The feeder is built on well-known principles and will give a steady and even feed, which is very important for clean separation. The amount of feed is easily changed simply by raising or lowering a slide. A handwheel for regulating the slide is provided on all sizes, which allows quick and accurate adjustment of the feed. The feeder is designed with a large throat and a heavy stirring shaft to prevent the material from bridging or clogging. The magnet of this machine is a strong stationary, electro-magnet, located inside of a revolving cylinder. The magnetic element in this separator is so arranged that only the working surface is magnetized; this, the manufacturers claim, is a great advantage in economy and efficiency over the ordinary pulley type magnetic separator in which the whole surface of the pulley is magnetized.

These separators may be driven as follows: (1) plain belt-drive with tight-and-loose pulley where direct current electricity is available for exciting the magnet and where the machine can be belted to some source of power; (2) plain belt-drive with small dynamo attached used where no electricity is available, but where a belt-drive can be used; (3) Motor-drive, with D. C. motor, for use where D. C. electricity is available but where belt-drive is not desirable or cannot be had; (4) Motor drive with special motor—generator set (an alternating current motor and direct current generator). The generator is to furnish current for the magnets and the motor to furnish power to operate both separator and generator.

SAND BLAST PRINCIPLES

The Pangborn Corporation, Hagerstown, Md., has issued Bulletin No. 50 containing principles and data relating to sand blasting. This information, which is of vital interest to manufacturers of metal products which require sand blasting for finishing, includes an explanation of the various systems used for the purpose. These are known under the head of Direct Pressure System, whereby the air and abrasive are combined in and discharged from a sealed container through a single nozzle and the Suction or Syphon and the Gravity Systems, whereby the abrasive is introduced into the air stream at or near the point of combined discharge.

As these descriptions are particularly valuable to the sand blast user in order for him to decide which system is the most suitably adapted for his purpose, they are reproduced here.

In the direct pressure system, of which the hose sand-blast is the commonest example, the abrasive, already under pressure in the sand chamber of the machine, is discharged in combination with the air, at gauge pressure, thereby obtaining highest possible velocity. The hose sand-blast is the first exposition of the principle of sand-blasting and will do any work possible with any other machine. It is particularly adapted to general jobbing work, large castings or extensive surfaces.

In the suction or syphon system, the abrasive is carried to the nozzle by suction created by a jet of compressed air, which, discharging through the nozzle, carries the abrasive with it. This system is represented by the sand-blast "gun" and when applied to the cabinet sand-blast provides a complete self-contained device that automatically reclaims the abrasive and continuously delivers it to the nozzle. The cabinet type of sand-blast is particularly adapted to medium-size pieces, and represents at a low first cost a complete unit for a small volume of work. As the air jet is smaller than the discharge nozzle, expansion takes place, so that the delivered pressure is below the gauge indication, with consequent decreased velocity.

In the gravity system the abrasive is brought to a point above the nozzle by mechanical means, and fed to the nozzle by gravity, where it is combined with the air and discharged, the full power of the air being imparted to the discharge of the abrasive. The gravity barrel sand-blast is an example of this system, which with its mechanical elevator makes a self-contained, continuously-operating unit. In the gravity system also the area of the air jet is less than that of the discharge nozzle. The gravity barrel sand-blast is the most economical, in fact the only system for cleaning pieces too small to be handled individually, and is adaptable to any pieces up to the imit of its holding capacity.

Copies of the bulletin may be had upon request.

THE MAJESTY OF THE LAW

A few years ago, as the result of a carefully planned conspiracy by a set of desperadoes, a citizen was murdered on the streets of New York. Due largely to the energy of the present Governor of this State, the five culprits, including a member of the city police force, were arrested, tried, condemned to death, and duly executed.

The vast enginery of the forces of law and order of the city and state were set in motion, not because the murdered man was a citizen of any distinction (as a matter of fact he was an obscure member of the underworld); but because the law for the protection of human life having been broken and a life deliberately destroyed, it was necessary for the future protection of human life that the law against the taking of life be vindicated. Those four young men and that police officer were put to death, not in any spirit of revenge, but rather by the automatic functioning of certain inviolable laws, which are the outgrowth of the age-long struggle of man to make this world of ours a safe place to live in.

The military master of Germany, while parading as the guardian of the peace of Europe, gathered together the men and the means for a war that should bring untold wealth to him and his people; and, when the time was ripe, he launched his marauding armies upon a peaceful and unsuspecting world.

For the vindication of the law in the case of the deliberate murder of one man, civilization, as represented by the City of New York, sent five men to the chair.

For the vindication of the law in the case of the deliberate murder of ten million men, what is the duty of civilization, as represented by that stricken world, for which our President is today the spokesman?

This is a question, the first whisperings of which are already audible—a question which is destined to thrust itself into the very forefront, as this awful tragedy moves on to its close.

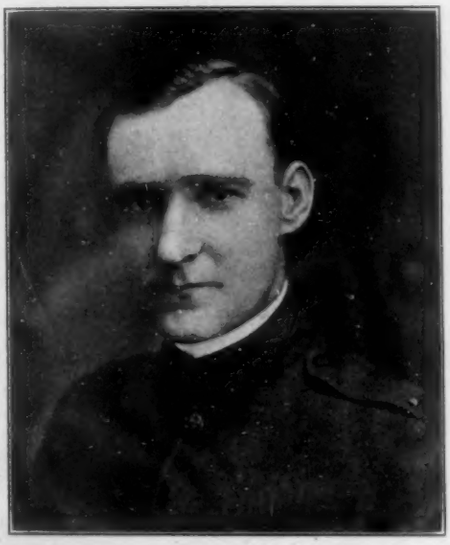
Fiat justicia, ruat coelum, said those great jurists, the Romans of two thousand years ago: "Let justice prevail, though the heavens fall." Is mitigation for crime to be found in its very magnitude? Shall the man who slays his fellow die, and the man who slays him by the million live?

But who shall be the judges and what code of laws by which the perpetrators of this world-butchery shall be tried?

Well, the leading nations are more or less committed to the proposal for forming an international court, which hereafter shall substitute the arbitrament of the law for the arbitrament of war.

What more fitting prelude could there be to the formation of such a court, than the selection of a chief justice from each of the nations of the Entente, and the formal trial, by the due processes of criminal procedure, of those leaders in Germany and Austria who hatched this conspiracy and let

METAL MEN IN THE SERVICE OF THE ALLIES—SERIES 8



LT. W. H. WESTERMAN.

The Metal Industry invites anyone connected with the metal trades who is in or has friends in the service to send in photograph and story of career.

H. R. NETTLETON.

Two metal men now engaged in the great war are **Lieutenant William Howard Westerman** and **Harry R. Nettleton,** son and stepson respectively of **William Westerman,** superintendent of the Michigan Copper and Brass Company, Detroit, Mich. Lieutenant Westerman entered the second Officers' Training Camp at Ft. Sheridan on August 27, 1917, and was commissioned second lieutenant November 27, 1917. He was then transferred to Camp Grant, Rockford, Ill., where he served in various departments and was promoted to first lieutenant on September 1, 1918, and on September 15 sailed for France with Company C, 803rd Infantry.

Mr. Nettleton joined the Michigan Naval Reserves from the Michigan University at Ann Arbor, Mich., the early part of 1917 and joined the United States Navy immediately after this country went to war. Mr. Nettleton was in training for about a year in the various naval stations in this country and is a member of the Naval Railroad Land Battery in France and now on the firing line. Mr. Nettleton was taking a course in metallurgical engineering at the Michigan University at the time of his enlistment.

Through four long years of agony, civilization has been called upon to witness, upon a world-wide scale, a repetition, in its salient outlines, of that sordid and brutal slaying which has passed into history as the Becker case. Substitute for that one murdered citizen ten millions of the very flower of the young manhood of the world, substitute for the infamous Becker and his accomplices the ruling caste of Germany and Austria, who conceived and set afoot this conspiracy of murder and loot—and the parallel is complete.

Becker, masquerading in a uniform which proclaimed him to be a guardian of the peace and security of the citizens, gathered his agents together and sent them to slay a man, whose removal would guarantee his own prospects of greater loot from the gambling houses that he had taken under his wing.

loose this welter of rapine and murder?

Let these men be represented by the ablest legal talent of their respective countries; and let the trial be conducted with all that meticulous care which marks the course of criminal procedure in the courts of the civilized world.

Let the accused men take the stand and testify, if they will, in their own behalf. Let the original State records be produced, and notably those, if such there be, which will prove that Germany moved Heaven and Earth to hold back Austria from her mad insistance. Let von Hollweg swear that he never in the Reichstag admitted that the invasion of Belgium was a moral outrage. Let von Jagow bring proof that he never referred to a German-signed treaty for the protection of Belgium as "a scrap of paper." Let von Tirpitz swear that he never sent his U-boats forth to do wholesale murder upon the high seas, and let him produce documentary evidence that the "Lusitania" was an armed cruiser, and therefore a vessel of war. Let the military records be brought forth to disprove the judicial murder of Nurse Cavell, Captain Fryatt and a hundred others.

And if it be objected that this would be a prejudiced proceeding, since no German or Austrian judge would sit on the bench, the answer would be that it was made so by the deliberate act of the accused themselves, who, in their international relations, had long ago disavowed the accepted laws of civilization, and substituted therefor a code of military expediency, brute force, and unbridled cruelty.

If the military masters of Germany, from Kaiser down, should be found guilty in the first degree, it is conceivable that the majesty of the law having been vindicated, the extreme penalty might be commuted, as a concession to the sentimentalists, to one of imprisonment for life.

But above all things: *Fiat justicia, ruat coelum.* And let it thus be recorded once again, and for the warning of all ages and peoples to come, that "They that take the sword shall perish by the sword."—The Scientific American.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

METAL MEN AS LEGISLATORS

Two of the best known manufacturers have been elected to represent the town of Torrington, Conn., in the state legislature. They are Frederick L. Braman, vice-president of the American Brass Company, and Charles H. Alvord, vice-president and general manager of the Hendey Machine Company. Both are able men, thoroughly acquainted with the needs of Torrington and are certain to capably represent the town.

Frederick L. Braman

Mr. Braman has been connected with the American Brass Company for 25 years and during that period advanced step by step from office boy to the important position which he now holds. He was born in Springfield, Mass., February 2, 1876, but has resided in Torrington since he was ten years old. He attended the public schools here until he was 17 when he put aside his text books to enter the employ of the Coe Brass Company, which is now a branch of the American Brass Company. In October, 1916, he was elected a vice-president of the latter concern, succeeding the late Elisha J. Steele. He is an active member of the Methodist Church, superintendent of the Methodist Sunday school, a member of the board of incorporators of the Charlotte Hungerford Hospital, director and vice-president of the Litchfield County Realty and Insurance Company, a director of the Torrington Trust Company and a member of the Sons of Veterans, the Torrington Club and the Hardware Club of New York. Concerning him the History of the Naugatuck Valley says:

FREDERICK L. BRAMAN.

"His influence is ever given on the side of progress and improvement both for the individual and for the community at large. What he has accomplished represents the fit utilization of his innate powers and talents, and persistent energy and capability have carried him steadily forward to the important place which he now occupies in the manufacturing circles of this city."

Mr. Braman is married and has one son, Harold, who is a student at Dartmouth College.

Charles H. Alvord

Charles H. Alvord has been actively identified with the Hendey Machine Company for 22 years and has been vice-president and general manager for 11 years. He was born at Bolton, Conn., a descendant of one of the oldest families of New England. An uncle, after whom he was named, was the founder of the Excelsior Needle Company, one of the leading industries of Torrington. Mr. Alvord acquired his education in the district schools of Bolton and at a business college in Hartford. In his spare time he worked on his father's farm, assuming the management at the age of 15 when his father died. He was 20 years of age when he came to Torrington and engaged with his brother-in-law in the grain business. In 1896 he became associated with the Hendey Machine Company as secretary, a position which he held until his election to the vice-presidency in 1907. Mr. Alvord is a director of the Torrington National Bank and the Manufacturers' Association of Connecticut. He is widely known in club circles, being a member of the Sons of the American Revolution, the American Society of Mechanical Engineers, Union League and Engineers clubs of New York, Torrington Club, Waterbury Country Club, Greenwoods Country Club, Automobile Club of America and the Litchfield County Automobile Club. He is also a 32nd degree Mason; chairman of the Torrington school committee; a director of the Wolcottville School Society and Hillside Cemetery Association; a member of the vestry of Trinity Church and of the board of trustees of the Charlotte Hungerford Hospital.

CHARLES H. ALVORD.

His wife, Clara Alice Alvord, is a daughter of the late Henry J. Hendey, founder of the Hendey Machine Company. The couple have one son, Carl G.

The voters of Torrington are fortunate in securing two men of the stamp of Mr. Braman and Mr. Alvord who are willing to give part of their valuable time in looking after the interests of the community at the state capitol.

DEATHS

CHARLES D. BENNETT

Charles D. Bennett died at his home, La Grange, Ill., October 2. He was identified with the plating material business for a number of years and was well known in this connection. Mr. Bennett was born in Sterling, Mass., April 4, 1845. At the age of 17 he accepted his first position with M. L. Snow & Company in the pottery business in his native town as traveling salesman, driving a four-horse team through the hills and mountains of Massachusetts and other eastern states, later becoming superintendent of their factory, holding this office for a number of years. In 1889 he accepted the position of general manager of the Sterling Emery Wheel Company at Tiffin, Ohio, and in 1895 was transferred to Chicago as branch manager for this company.

CHARLES D. BENNETT.

The following year the Bennett-O'Connell Company was formed as a co-partnership concern to manufacture and deal in polishing and plating supplies, later the company was incorporated with Mr. Bennett as president and treasurer. He retired from the Bennett-O'Connell Company in September, 1914, and in 1915 became associated with S. E. Huenerfauth in the manufacture of Crown rheostats. In February, 1916, the company was incorporated as the Crown Rheostat and Supply Company, with Mr. Bennett as president and treasurer. He was taken ill in November, 1916, following a business trip through the eastern States, from which he never fully recovered.

Arthur F. Hoerle, son of C. G. Hoerle, secretary of the Union Hardware Company, Torrington, Conn., died of pneumonia on October 22. He was ill 12 days. Mr. Hoerle was 25 years old and had served an apprenticeship as toolmaker at the Union Hardware plant and as draughtsman at the Farrel Foundry & Machine Company, in Waterbury, Conn. At the time of his death he was superintendent of the block and forge departments of the Union Hardware Company. He leaves his parents, two brothers and two sisters.

Charles W. Chase, secretary-treasurer of the Electric Smelting and Aluminum Company, Lockport, N. Y., died suddenly in his automobile on his way home October 22. He was prominent in many business enterprises in northern Ohio.

John Kroder, president of the firm of The Kroder & Reubel Company, brass goods manufacturers, died September 28, at his Summer residence in Long Branch, N. J. Mr. Kroder's city home was at 65 Central Park West. A widow and several children survive him.

As we go to press we learn of the death on October 28, 1918, of **Sherman Bougher,** secretary of the J. W. Paxson Company, Philadelphia, Pa.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

BRIDGEPORT, CONN.

NOVEMBER 11, 1918.

Ninety thousand five hundred subscriptions of the Fourth Liberty bonds in Bridgeport boosted its total to over $12,000,000, and this city claims that it exceeded any city in the state in the number of subscriptions. The actual number of factory employes who subscribed was 50,989, which is really all that an entire city would claim. Bridgeport factory workers and factory corporate subscriptions came to a little under $7,000,000, a showing that may be held up with some pride as an industrial center of its size. The Union Metallic Cartridge Company is one of the largest factories here, and on all occasions has turned in the largest number of subscriptions on Liberty Loans and Red Cross drives. This time the foremen's association gave two fifty-dollar bonds to employes and this was done by giving a ticket which would entitle the holder to a bond bought after Wednesday of the last week of the drive. Persons were urged to repeat on purchase, and when doing so were given a button reading, "I have repeated on the Fourth Liberty Loan." They went "over the top" with a total of $875,000.

The Lake Torpedo Boat Manufacturing Company reached a total of $250,000. The concern employs 2,050. The Crescent Die and Tool Manufacturing Company employes raised $900, which was enough to make the 100 per cent of the 189 employes. The officials of the American Chain Company made a splendid offer to their employes, which was taken right up. To every employe who was a subscriber, and who paid up his subscription, was given an opportunity to win a bond just double the amount of his subscription, but the maximum was placed at $300. For instance, if an employe took a $50 bond, he stood a chance to win a $100 bond once a week for 50 continuous weeks. If he subscribed for $150 in bonds, he stood the chance of winning a $300 bond for 50 weeks. The officers of the company made up a million dollars for their employes, so that if the employes subscribed for $800,000 in their twelve factories the company would make up the remainder. The Bridgeport factory subscribed for $98,350.

The epidemic of Spanish influenza has grown quite serious in Bridgeport. It has increased so much up to date that many of the factories are considering seriously inoculating all their employes. Some already have done so. Physicians connected with the Health Department of the city have taken a hand in fighting the epidemic in the factories and have inoculated a great many of the employes of the Remington Arms and the Bullard Machine Company. The treatment will be continued until all of the employes who are willing will be made immune from the disease by receiving the hypodermic. After an interval of a few days, a second hypodermic is given. The health officer offered the use of this serum to every one of the factories, but the response was not very enthusiastic, as the inoculation was new, and just what results could be expected was not certain. The only plant in Bridgeport anxious to have this serum used was the Remington Arms plant. The Bullard factory later agreed to its use, and other factories keep sending in word that they would like to have it used. There are no effects from the taking of this hypodermic and nothing but good can result. It is given with a hope that it will help to keep down the number of cases that are reported each day. About 35 members of the American Chain were reported absent on account of the epidemic, but not all these are thought to be ill themselves, but have been compelled to stay out to take care of the members of their families who are sick, owing to the shortage of nurses. In all cases the factories keep in touch with the employe, sending, in a great many cases, nurses and food when needed.

The number of women in the munitions industry is steadily increasing, according to statistics. One plant which had 32 per cent women employes in 1915 now has 50 per cent.

The largest orders for motor vehicles ever placed with the Locomobile Company of America have been assigned here by

the Motors and Vehicles Division of the office of the Director of Purchase and Storage of the War Department of Washington. The full scope of the order is not obtainable because of War Department restrictions, which bar factory officials from disclosing quantities or types of goods fabricated, but it is generally known, through information sanctioned by the War Department, that this order is part of war contracts given to automobile manufacturers throughout the United States aggregating $130,000,000. In order to care for the work which will be undertaken at once, large additions to the Locomobile plant now are being completed, and the entire factory will be put to work upon the new orders. In the past the Locomobile has done large volumes of work for the Government and also for the British Government. Its daily output of trucks alone today is very large, and with the addition of the present orders the output is expected to greatly increase.

In order to help solve the trolley transportation in Bridgeport lately, during rush hours, the trolley company has asked the Remington Arms plant to supply 50 men to operate the cars during the early morning and also in the evening. A number of men immediately volunteered and will be expected to work two hours in the morning and the same in the evening. They will simply be loaned to the trolley company.

Because of the labor shortage here, factories will soon get some limited service men of the United States Army for aid in the production of munitions. Under the new plan these men will be trained in certain specialties required by the Government. They will, it is understood, be permitted to lay aside their uniforms while actually engaged in war work. They will be paid the regular wages accorded civilian employes in similar capacities and will be required to provide for their own subsistence.—L. M P.

TORRINGTON, CONN.

November 11, 1918.

Factory employes in Torrington did their full share in helping to oversubscribe Torrington's quota of $1,276,000 of the Fourth Liberty Loan. The per capita subscriptions of 7,232 employes was slightly over $53. The report follows:

	Employes	Bonds	Amount	Per Cap.
Progressive Manufacturing Company	125	142	$9,500	77.02
Warrenton Woolen Company	92	101	6,900	75.00
Torrington Building Company	65	62	4,150	63.85
Schroeder Brothers	27	28	1,750	62.50
American Brass Company	2,510	2,459	150,850	60.10
Standard Company	727	636	39,550	54.40
Hendey Machine Company	895	842	48,100	53.74
Union Hardware Company	610	551	32,350	53.03
Hotchkiss Bros. Company	110	87	5,650	51.36
Turner & Seymour Mfg. Company	550	484	27,800	50.54
Torrington Mfg. Company	184	153	9,250	50.27
Excelsior Needle Company	1,186	812	47,150	39.92
Fitzgerald Mfg. Company	150	80	4,100	27.33
Totals	7,232	6,437	$387,150	53.53

The influenza epidemic in Torrington played havoc with the labor in local factories during October. Approximately 3,000 cases were reported, and there were about 70 deaths. An emergency hospital accommodating 100 patients was opened in the High School building. Theaters, churches and other public gathering places were closed by the health officer. Toward the latter part of the month the Torrington company was able to obtain a supply of the new influenza antitoxin and all the employes of the company were inoculated. Later the other shops were able to secure the antitoxin. This did much to check the spread of the disease. The expense of inoculating the employes was borne by the companies.

Ninety-nine soldiers from Camp Devens, Ayer, Mass., were sent here in October to work at the Coe Brass Branch of the American Brass Company in an effort to relieve the labor situation. These 99 were part of a contingent of 1,000 sent to brass mills throughout the Naugatuck Valley, principally to Bridgeport, Ansonia and Waterbury. Additional soldiers were to be sent later from Camp Upton. A recent report of the War Industries Board, concerning the labor situation in the brass mills, said:

"One thousand soldiers from Camp Devens, Mass., were sent into the mills in the Naugatuck Valley, which includes the brass mills of Torrington, Bridgeport, Waterbury and Ansonia, Conn., but more will be needed. When the detailed estimates of the situation were made, the rolling mills were short 9,600 men, or approximately one-third of their labor requirements; and production rate in the mills had been cut down to 15 per cent less than the actual production rate during the six months period ending June 30, 1918, in spite of the increased demand. The manufacturers frankly admitted they were desperate. With the coming of cooler weather there was for a brief spell a slight improvement in the labor situation, but last month, when the influenza epidemic was raging, between 20 and 40 per cent of the mill employes then on the payrolls were laid off sick. What the lost production has been in consequence of this it has been impossible as yet to estimate. Meanwhile the demands for the metal in the war program of the Government grow steadily. For example, the requirements of the Government and its Allies, for brass for small arms ammunition and artillery shells up to 4.7 caliber, amount of themselves to approximately 200,000 pounds of brass per day.

"The advantage of the metal in the manufacture of ammunition lies in the fact that it is easier to work than steel and does not corrode and is stronger than copper. On the other hand, the processes of its manufacture require more labor. In its various forms it is an alloy of copper. Because it is an alloy, however, the processes of manufacture are more complicated than the manufacture of copper products, which, generally speaking, are turned out direct from the raw material as it comes from the refinery. With brass, the copper ingots must be melted in crucibles and mixed with the appropriate amounts of zinc or nickel. Whether it is sheet or rod brass that is to be turned out, it is all a rolling mill process, and both are made in the same mill, but in the rolling mill process brass requires more labor for its handling. Manufacturers of brass refuse to promise any date for shipment, and when the metal is wanted for non-essential work, three or four months are required for delivery.

All kinds of foundry supplies have increased in value five to eight per cent.

Ship-propellers are now being turned out at the plant of the Turner & Seymour Manufacturing Company. Several shipments have already been made.

There has been a gratifying improvement in freight conditions during the past month. Incoming shipments of practically everything but coal are being pushed through rapidly. So far as coal is concerned, however, the tonnage is considerably behind the amount promised.

ROCHESTER, N. Y.

November 11, 1918.

Despite the fact that there has been no improvement in shipping facilities in or out of this city, manufacturing plants are running at full speed and many with overtime shifts. This is particularly true in the case of the munition plants, of which there are several in Rochester.

According to information obtained yesterday, many of the larger concerns are drawing heavily on their reserve stocks of metals, owing to the absolute inability to obtain shipments into the city. Copper and brass ingots are out of the question just now, and even spelter entering into the manufacture of brass is hard to obtain.

It is said that there is no occasion for alarm at the moment, as there are stocks in the city that will carry every big manufacturing plant along over a period of from four to five months at least.

The shell factories are running at top speed, and are consuming an enormous amount of copper, brass and aluminum. At least a dozen of the biggest plants in the city are busy in producing war materials. Bausch & Lomb's big war plant is in complete operation, and much war material is being produced in the older optical buildings as well. One whole floor devoted to making war material is operated entirely by women. The only male individual permitted in the floor is the superintendent. The women are turning out a superior line of work, brass, copper and aluminum entering largely into their department.

All plants doing government work are well provided with the raw materials.

The Rochester Can Company's new plant in Hague street is turning out thousands of tin derbies for the War Department each week. The factory added 47,000 square feet to its manufacturing space recently and added two stories to the old plant.

As soon as the war ends and fairly normal conditions are restored it is probable that an extensive toy factory will be established in this city. The head of one of the most important plants on the west side of the city is said to have obtained patents on toy automobiles, fire trucks, submarine and torpedo boats and battleships, all of which are operated under their own power and are of superior construction. Tin, tin plate, copper, brass, aluminum, and nickel will enter largely into the construction of these toys, which are bound to become popular and displace the market formerly controlled by Germany.—G. B. E.

PROVIDENCE, R. I.

November 11, 1918.

As though the extraordinary shortage of "man power" because of the direct and indirect demands and conditions of the war situation was not enough to hamper and discourage all lines of the metal trades, the past month has witnessed the additional burden imposed by sickness and deaths from the epidemic of Spanish influenza and its insidious aftermath—pneumonia. The result of this epidemic was to materially curtail work in all of the plants, in some instances as high as a 25 per cent drop being reported. The end of the month, however, found the situation considerably improved and the outbreak on the wane.

War work, in some form or another, is now demanding practically all the productive capacity of the numerous plants and establishments in Providence and vicinity engaged in, or fitted for, the turning out of metal parts, munitions or materials for the prosecution of the great world conflict. While there has been an increasing amount of work called for during the past four and a half years, the demands of the past month have been far in excess of those of any preceding period, and still the maximum does not appear to have been reached. As a result the employment of women on work formerly performed by men is largely on the increase and their work is said to be proving satisfactory.

The diverting of practically all metals from the "less essential" industries to those producing war materials and supplies has been especially crippling in effect upon the manufacturing jewelry branches. First, there was a curtailment in the supply of gold furnished, which put a crimp not only in the production of solid gold lines, but also in the production of rolled plate. This was explained principally on the ground of a war preventive to guard against gold, even in a wrought form, eventually reaching enemy hands through neutral channels. Then came the curtailment and eventual cutting off entirely of the supply of brass, thus almost completely shutting down the manufacturers of the cheaper grades of goods. Platinum also came under the ban. All in all, the jewelry manufacturers have had an uncertain career during the past few months.

Another phase of present conditions is the abnormally high scale of wages that are being paid to machinists and other metal workers. This situation has been brought about largely by the offering of high pay by concerns having Government contracts to fill, taking waay from the regular occupations hundreds of men who are attracted by the fat pay envelopes now in vogue.

So difficult has it become for concerns to hire all the help they require for getting out the work for the Government that drafts of select limited men from the cantonments and camps are being utilized. A detachment of fifty men arrived in this city on November 1 from Camp Upton, who were assigned to the Phillipsdale plant of the Gorham Manufacturing Company, and 200 more were to be sent in details of 50 and 100 to take up the work as rapidly as facilities for them could be arranged.

For the purpose of effecting compromises with manufacturers in the metal trades industries in this state, to work in harmony with employes under the rules laid down by the War Labor Board, a Metal Trades Council, A. F. of L., was formed on October 21 in this city at a meeting of representatives of the twelve crafts in the metal trade. Temporary officers and a temporary executive board was elected. Among the crafts to be included in the membership are electrical workers, metal polishers, foundry employes, sheet metal workers, molders, and patternmakers. The regular meetings will be held the first and third Mondays in each month.

"We are going to invite the manufacturers of Rhode Island in the metal trades to conferences to arrange a working basis according to the rules of the War Labor Board, and we intend to do all the War Board asks of us," said Frank Jennings, the organizer, in explaining the purpose of the new organization. "The most successful Metal Trades Council in the United States, perhaps, is that in San Francisco, which for ten years has worked harmoniously with the employes in the metal trades in that district. The council is affiliated with the American Federation of Labor. Formerly there was a council in Providence, but it is being started up anew."

* * *

At least 1,000 more women from Rhode Island and vicinity must be secured at once to make possible the greatly increased output of ammunition at the Phillipsdale plant of the Gorham Manufacturing Company in East Providence, which is now being arranged for. Rhode Island has become one of the centers of war activity, in munitions, as well as in numerous other lines, and women, to a great extent, have been helping to keep a steady stream of munitions going overseas. The Gorham company has recently been awarded an unusually large contract for certain of its productions, and Rhode Island women again are asked to step into the breach to take the places of men who have gone to the front, in turning out munitions, as the supply and reserve must be greatly increased during the winter.

What is believed to be the world's record for loading hand-grenades is held by Miss Helen Pilloni, of 9 Tower street, Providence, an employe of the Gorham Manufacturing Company's Phillipsdale plant. Her record is 10,080 grenades in nine hours. The company's belief that she holds the world's record is based on accounts about an English worker and accomplishments of their own employes. Two months ago an English worker was hailed as a record breaker for loading 6,000 grenades in nine hours. Soon after that, one of the Gorham employes loaded 8,000 in the same time, and now Miss Pilloni tops these with 10,080.

* * *

The New England Butt Company is having a one-story addition erected at its plant on Pearl street.

The Kescot Manufacturing Company, Inc., of Providence, has been incorporated under the laws of Rhode Island for the manufacture and dealing in jewelry, with a capital stock of $100,000 divided into 1,000 shares of $100 each. The incorporators are William J. Keith, of Edgewood, and Arthur Cushing and William F. Carroll, of Providence.

The Eagle Nickel Plating Company, 35 Garnet street, Providence, is being conducted by Oscar Jorjorian, according to his statement filed at the office of the city clerk.

The Fulford Manufacturing Company, 14 Blount street, Providence, manufacturers of jewelers' findings and tools, metal ornaments, etc., has increased its capital stock from $250,000 to $400,000, according to information filed with the Secretary of State's office.

Announcement has been made that the Pawtucket Electro Plating Company, in the old Slater Mill, rear of 79 North Main street, Pawtucket, R. I., is now under new management, with Samuel Weisman as proprietor.—W. H. M.

MONTREAL, CANADA

November 11, 1918.

The shortage of labor in the brass manufacturing plants was considerably increased by the Spanish Influenza Epidemic this month and it has caused quite a slump in production. In some instances the deficiency in numbers amounted to 25 per cent. and over the number on the pay-rolls.

Steady and uniform production is now beginning to be maintained with the excellent manufacturing organizations with the the epidemic being rapidly under control and strict Sanitary measures employed by the manufacturers here it has enabled the health authorities to co-operate and stamp the germs out effectively and reduce the mortality to a large extent.

A sharp decline in prices prevailing on solder has become effective during the month. The market on tin has gradually

receded from the high levels reached in its meteoric flight a couple of months ago and this has been the main factor in the easier tendency of solder. Lead however is very scarce and practically all available supplies are being used in the prosecution of essential war work. This provides for a very firm undertone to the market on manufactured lead products, such as traps, bends, etc.

An increase of from 10 to 15 per cent. is provided for in new prices issued on silver-plated flatware. The Henry Birks Company, St. Catherine and Philips Square, the largest manufacturing jewelers in Canada report their factory very busy at this time.

Robert Mitchell Manufacturing Company, St. James street, are running all branches of their plant overtime to keep up with their orders.

The Montreal Locomotive Works, located at Long Point is running a double force to fill large orders for export and is using large amounts of copper and other metals.

The business outlook for a good winter is very promising at this time of year in all lines of manufacturing.—P. W. B.

CINCINNATI, OHIO

November 11, 1918.

The attention of leading members of the metal trades in Cincinnati was occupied largely during the period of the Liberty Loan campaign, lasting until October 19, with the work of putting Cincinnati "over the top" for its quota of over forty millions; and so well was this done that an over-subscription of about 25 per cent, or a total of fifty million dollars, was achieved. This was accomplished by an organization of solicitors said to be one of the finest in the country, by means of which every family and every factory worker was approached; and as about 180,000 separate subscriptions were obtained, it can readily be seen that the approach was successful in a vast number of cases.

For example, in the great Oakley manufacturing district, where some of the largest machine-tool plants in the city are located—the R. K. LeBlond Company, the Cincinnati Bickford Tool Company, the Cincinnati Lathe & Tool Company, the Cincinnati Automatic Machine Company, the Oakley Machine Tool Company, the Cincinnati Planer Company, and others—a team of machinery men canvassed the district to such good purpose that most of the plants named were honored with 100 per cent emblems, indicating that every employe had subscribed; while the manufacturers themselves, as a matter of course, subscribed handsomely to the bonds.

Similarly good results were reported among the trades all over the city; in fact, the Spring Grove avenue, Winton Place and Mill Creek Valley districts, where the tool and machinery plants are located, all showing up splendidly. It would be difficult to name all of the concerns which bought over the $5,000 minimum established for public listing of subscribers, as it would include practically every company in the trade; but among those whose employes, encouraged by the manufacturers, all bought bonds, thus winning the coveted 100 per cent designation, were the Queen City Machine Tool Company, the Grand Machine Company, the Shepard Lathe Company, the Advance Tool Company, the United Lead Company, the Lunkenheimer Company, the Cincinnati Tool Company, the Cincinnati Stamping Company, the Cincinnati Electric Tool Company, the Eagle-Picher Lead Company, and many others.

The campaign was hardly over, with the splendid results indicated, before many of the hard-working executives who had given freely of their time and energy to help push the loan, were called into a similar organization for the Cincinnati war chest, which is to be filled in November with gifts of not less than four and a quarter million dollars; and it is a foregone conclusion that this will also be done without difficulty.

The epidemic of influenza, although by no means as serious in Cincinnati as in some of the Eastern cities, has been sufficiently general and hard to combat to affect the working efficiency of the manufacturers very generally. The number of deaths at this writing has been under six hundred; but the total number of cases is estimated as high as 22,000, and as these are largely among people in their prime, and especially those exposed to public contact and infection, the number of absentees ill with the influenza has been considerable in many plants. As activity is great, on account of the heavy demand for tools for munition and other Government work, this interference with maximum efficiency has come at a bad time, and it is hoped that the disease will soon be stamped out.

Manufacturers of metal stamps, stencils, tags and similar goods, of whom there are a number in Cincinnati, have received instructions from Washington to the effect that for six months production must be curtailed to 75 per cent of the volume for the corresponding period of 1917, in order to conserve needed material for other purposes.—K. C. C.

COLUMBUS, OHIO

November 11, 1918.

The metal market in central Ohio territory continues rather active, although there is a slight falling off in business from the previous month. This is attributed largely to the fact that metal-using concerns stocked up fairly well and are now using their surplus stocks, rather than buy for the future. The tone of the market is generally good and future prospects are considered good.

Supplies in this territory are adequate for the present. Shipments are coming in fairly well, although more delay in receiving consignments is reported than was the case a month ago. Prices are firm at the levels which have prevailed for some time. Most of the prices in this territory are Government fixed and consequently open to no variation.

Brass and copper are both fairly strong. There is also a fair demand for aluminum. Type metals are still one of the strongest points in the market. Spelter is in good demand and lead and zinc are also moving fairly well.

Milton Loeb, son of Henry Loeb, head of the Ohio Metal Company, of Columbus, a lieutenant in the Quartermaster's Department of the Aviation Service, stationed at Garden City, L. I., was on a short furlough with his parents recently. Young Loeb has about decided to try for the flying service proper, with a view of getting active service on the Western front.

Metal workers and shops and factories having to do with the metal trades came to the front in grand style during the Fourth Liberty Loan campaign. The Columbus quota was slightly in excess of $12,500,000, and this amount was oversubscribed by several millions. Workers generally responded more liberally than during previous Liberty Loan drives. The Jeffrey Manufacturing Company came close to being 100 per cent, and the same is true of other concerns.—J. W. L.

CLEVELAND, OHIO

November 11, 1918.

What is believed to be the most significant development of the war in connection with the metal industry here occurs with the turn of the month, when Cleveland shops and factories are placed upon a real win-the-war basis. At that time the Federal Labor Committee of Cuyahoga, Lake and Medina counties begins its task of directing the man-power of the district into channels looking to the winning of the war. The Cleveland district is the largest labor section in Ohio, and will be expected to furnish not only its own labor, but considerable of that for other parts of the state not so well equipped. This will be a most important change for the metal industry, for the trade here as a whole is not oversupplied wth skilled labor, although there is a more plentiful supply of the unskilled variety.

So far the metal industry has not been approached, but it is the plan of the labor board to call upon those plants engaged in non-war or non-essential work to surrender some portion of their labor to war plants in need of such, according to Francis T. Moran, chairman of the local board. On this board also are John A. Penton, of the Penton Publishing Company, representing employers, and James F. Malley, business agent of the Building Trades Council. Questionnaires now are being sent out to firms, of which there are several thousand in the district. From these will be gleaned the facilities and needs of all plants, and will be the means of starting the redistribution of labor. Incidentally, it is expected to learn just how vital each firm is toward winning the war. Among the employers and labor affected by the impending change are tinners, sheet metal workers, pattern makers, polishers, machinists, molders, and the like iden-

tified with the metal industry. It is the plan of the committee at present not to curtail drastically all non-essential work, but to replace in part at least men taken for war work with women capable of doing their present work. Also satisfactory places will be obtained before workers are asked to change their occupations. Consistent co-operation from Cleveland employers will be asked, and this has been assured months ago by the members of the metal industry.

How important the Cleveland district in metal trades is considered by allied interests in other parts of the country, is demonstrated this week by the appearance here of D. M. Hess, of the Midvale Steel Company, Eddystone, Pa., who was here to discuss subletting of contracts for rifles with local firms. He said the company seeks to turn out 8,000 rifles a day, or about two-thirds of the entire output of the country at present. He is considering placing contracts here with anywhere from 10 to 25 shops. In addition to this the War Industries Commission of the Cleveland district, which embraces the northern half of Ohio and counties in western Pennsylvania, has succeeded in placing so many contracts among interests in this district that inquiries for contracts are coming in from eastern and far western states, according to Secretary W. E. Tousley, of the commission. Copies of Government requisitions are sent direct from the Washington branch of the Cleveland commission to this city, and within a few hours the wants of the Government are known to thousands of manufacturers who are able to bid. This is making for unprecedented industrial production in this territory, Mr. Tousley points out. Charles A. Otis, former president of the Cleveland Chamber of Commerce, is now forming similar commissions in other states.

That Cleveland will be the starting point for the bombing of Berlin, if Germany does not cave in before the bombing program starts, was practically settled this week, when the Senate Military Affairs Committee asked John D. Ryan, director of aircraft production, for unhampered production of the Glenn L. Martin bombing plane. Interests connected with this gigantic project here are for manufacture of this plane as rapidly as possible and without change in present design. The Martin plane was officially accepted by the War Department this week, after tests in which planes were sent to Dayton from Cleveland. Immediate production of machines by hand, to the extent of fifty planes, is urged, awaiting the early arrival of special tools for more rapid production. It is expected at least fifty Cleveland firms will be given contracts for making parts. These firms have not yet been named.

Preparations by Cleveland metal industry interests to meet the needs of soldiers, possibly maimed, upon their return from war, already are under way at some plants. One of the first to adopt a consistent program is the Standard Tool Company, where 25 men, not in full possession of their faculties, are already employed. Their work is similar to that which will be given to disabled soldiers. The men at the Standard have lost one or both legs. Men without arms are not employed, as this particular work requires adepts with fingers. There is room for more disabled men here, says an official of this company, but returning soldiers and sailors will be given preference. While men without arms cannot be employed here, there are other plants coming to the front where they can be used, and so the problem of how to deal with the crippled fighting man is gradually being solved before it becomes a problem, at least as far as this branch of industry is concerned.

A. S. Deutsch, president and treasurer of the Monarch Brass Company, native of Alsace-Lorraine, has started his free French classes to enlisted men, or men who expect to enter the service. The lessons are given at the Central Y. M. C. A. Mr. Deutsch is holding three classes a week. He intersperses the lessons with interesting bits of history about the Franco-Prussian War, some of which has been told previously in this column.—C. C. C.

DETROIT, MICH.

NOVEMBER 11, 1918.

Detroit's Liberty Loan quota was $73,000,000. This amount was raised in two weeks, but the entire amount of the subscription from this city totaled $78,000,000 before the books were closed. The money came easier than any other previous loan. At the present time the Victoria Loan is under call in Canada, and Detroit is helping out this drive. The Canadian loan is quite attractive, as the bonds, it is said, bear 5½ per cent interest.

Peace prospects apparently have no effect on the munition plants here. All are working under pressure, this being especially true in reference to the aeroplane work. It is reported here that production is so heavy that ships are not sufficient on the Atlantic to keep the planes clear of the piers.

Shipbuilding also is speeded up, and the Ford Eagle plant here is reported able now to show good production. Other shipyards along the Detroit River are rushing general cargo carriers for Atlantic trade.

Automobile plants now are reported about ninety per cent engaged on war work of various kinds. Almost no pleasure cars are being manufactured. Trucks, however, are turned out in great numbers—almost altogether for Government service.

The coal situation is well in hand, and a famine is not believed possible the coming winter. It is reported that a few of the smaller brass plants have completed their Government contracts and are laying off men. As a general thing, however, labor is scarce, and to meet this situation the Detroit City Council has passed an ordinance that every man up to 60 years of age must carry with him a card showing he is engaged in some kind of employment. Those found idle will be arrested, fined or sent to jail.—F. J. H.

CHICAGO, ILL.

NOVEMBER 11, 1918.

Discussion of peace in the capitals of the world and its apparent proximity have unsettled the new metal market in Chicago and tributary territory. The trade evidently expects lower prices at the conclusion of the conference on peace and evinces hesitance in important transactions.

The demand for tin is far in excess of the supply, and as a result, drastic measures have been taken by manufacturers and distributors to curtail the consumption. These restrictions are based on economy in the quantities used by the various industries and are patterned after the national campaign of the War Service Association of Solder and Bearings Manufacturers. During the last few days the market has shown less strain.

Tin here is firm at 75 cents a pound. The greater part of it is bought eagerly by can manufacturers, meat packers and automobile makers.

The supply of spelter is equal to the demand. The price is $8.75 per 100 pounds, which is considered fair when compared with the cost of production.

Work only of national importance or directly for the government is permitted the use of lead which is bringing $7.75 per 100 pounds f. o. b. St. Louis.

There is on hand plenty of brass to satisfy the demand. Prices are consistent with those of raw metals. Ingot brass sells from 16 to 38 cents a pound, covering all grades and kinds. Conservation measures applied about a year ago to stabilize the supply of brass no longer are needed. High prices have stimulated the market and attracted the reserve stocks. Zinc is selling at 8¾ cents a pound; supply good. Copper at 26 cents a pound is offered in quantities here sufficient to supply the demand.

Supplies of aluminum (secondary production) are ample at the governmental price of 33 cents a pound.

Conditions as to labor are declared acute. Influenza and the war drafts have contributed to the creation of a scarcity of man power so serious that fully 50 per cent of the metal industry in this market is affected. Relief is expected after the crops are gathered when the men now working on farms will return to the cities. The shortage of labor has not caused any appreciable retardation in the production of essentials, but has hit other production hard. Many machine shops here are employing women.

Wages are the highest in the history of the industry. Common labor receives an average of 40 cents an hour. Skilled workers are paid from 65 cents to $1 an hour. This condition is nullified by an increase in sales estimated at 50 per cent greater than those immediately prior to the present war and extending into every branch of the industry. Those who watch industrial conditions closely here predict that after the war wages will not be materially reduced, but that the volume of sales will be decreased owing to a drop in the demand.

Dealers here await with great interest the application of the decisions of the interallied council in London relating to tin, and expect to operate under its regulations within the next 60 days.

That the trade here is co-operating unrestrainedly with all governmental agencies was evidenced in the campaign for the Fourth Liberty Loan when the metals industry "went over the top" with a plus subscription of 20 per cent, or a total of $1,200,000. There have been no protests to the application of governmental restrictions, but in a few instances there have been shortages of raw material and cessation of operation due to ignorance of the regulations. Thus far there have been no flagrant violations of governmental restrictions.

No direct war contracts have been entered into with firms in the Chicago market, but nearly all of them are working on indirect contracts, largely for white and red metals.

The supply of coal is good. Most large consumers have stocked for the winter.

Louis Birkenstein of the firm of S. Birkenstein & Sons, is serving the quartermaster's department in Washington in charge of salvage. His salary is $1 a year, and he is considered one of that army of "big men" who is winning the war over here. —J. L. N.

MILWAUKEE, WIS.

November 11, 1918.

Most of Milwaukee's metal manufacturing concerns are still behind in their war orders to a considerable extent, with more pouring in constantly. The labor shortage here, as in other cities throughout the state, is hampering the work, and with the new draft coming on, it is felt that the industry will be still more handicapped.

More and more girls are being engaged, however, and this is relieving the situation to some extent. There does not seem to be any difficulty experienced by the firms in getting raw materials, although the freight situation here is not much improved.

Several of the large concerns here, including the Bucyrus Company and the Harley-Davidson Company, attended the export meeting in New York. Milwaukee manufacturers are waking to the importance of exporting after the war, Secretary W. G. Bruce, of the Association of Commerce, declared. He pointed to the growth in the interest shown among the small, as well as the large manufacturers, who realize the need for foreign trade when peace comes.

"The Federal Bureau on Vocational Training in conjunction with the Department of Commerce, has agreed upon a plan whereby classes in foreign trade are to be established in industrial cities," Mr. Bruce said. "This plan provides that the Government will furnish the text books and necessary educational literature and that the local authorities will provide the class room housing and teaching forces."

Arrangements are already being made by Milwaukee manufacturers and trade organizations to arrange for night schools in foreign classes.

The recent large metal congress held in Milwaukee is still being discussed in some quarters here as proving to be of the greatest educational advantage manufacturers have benefited in through conventions. The extensive exhibits and demonstrations have opened their eyes to the possibilities of the industry.

James L. Sinyard, secretary of the A. O. Smith Corporation, and president of the National Association of Drop-bomb Manufacturers, returned to Milwaukee recently from Washington, and declared that the Government now has enough bombs to load every bombing airplane in France and at home for any number of flights. He asserted that his plant was the largest engaged in making bombs, having 2,400 men specializing on them.—B. E. S.

LOUISVILLE, KY.

November 11, 1918.

Louisville coppersmiths are working to full capacity at the present time, and report that they have all the business they can handle, although they could do considerably more if a better supply of labor could be had. A large percentage of all the work that is being done here at the present time is on either direct or indirect Government contracts, many of which call for very heavy copper work. There has never before in the history of the metal working trades in Louisville been a time when the trade was so generally busy as is the case just now.

The influenza epidemic, while very serious in Louisville, has caused comparatively little trouble in the copper trade, and in many shops not a single employe has been affected. However, in many industries conditions have been so bad that plants were forced to close down, this resulting in a smaller demand from some industries for special work.

Alex A. Gregoire, of Ahlers & Gregoire, Louisville coppersmiths, reports that the company is working full time on copper tubes for the Henry Ford Company, to be used in the Eagle patrol boats made by that company. The Louisville concern is making the tubes up from sheet copper, bending and equipping them for rapid assembling at the Detroit plant. One or two small contracts on food plants represent the only work that the concern is doing other than the Ford work.

Matt Corcoran & Co. are also busily engaged on tube contracts for use in vessels, and have been busy for several months past in making up and bending tubes into the desired styles and sizes. The company at present is working on a capacity basis subject merely to the number of coppersmiths which can be secured.

C. Mortensen, representing the house of Hines & Ritchey, Louisville, recently closed an excellent contract in Alabama for equipment for a large sized milk plant, and has two or three other contracts lined up. Tom Hines, of Hines & Ritchey, stated that there was an excellent demand for milk machinery, but that it was very hard to secure the necessary copper tubes and sheets for the work, due to the fact that while such machinery is essential it is not for direct war work, and not on the priority list of war necessities.

The Vendome Copper & Brass Works has been kept on the jump all season with various war orders, principally for use in completing vessels for the Emergency Fleet Corporation. Most of this work is on tubes.

Thomas Hines, of Hines & Ritchey, was a member of one of the teams in the Fourth Liberty Loan, and secured a number of excellent subscriptions. Mr. Hines reported that every employe of the company subscribed for one or more bonds, and the company went on the honor roll. A number of other local coppersmiths followed this same idea, with the result that very few trades made a more patriotic showing than the copper working trade.

The shortage of labor in Louisville has been especially severe within the past few weeks, due to the fact that construction work at Camp Knox, Stithton, Ky., is taking all available men. John Griffith & Sons, of Chicago, general contractors on the job, are at present advertising for 6,000 laborers and 4,000 carpenters, in addition to approximately 12,000 men now on hand. Metal workers, plumbers, steam fitters, and various other tradesmen are required in handling the big construction job.

W. R. Wuest, of Wuest Brothers, operating a metal stamping plant at Tenth and Hill streets, Louisville, reports that he now has eight big presses operating, and is installing an additional one. Three fifty-ton Verden, Kappison & Verden presses are in operation, besides some smaller Bliss, Toledo and Fairicute presses, which are used for stamping out brass, soft steel, black sheets, etc., for various purposes. At the present time the company is making a lot of Government work, including metal box corners, angle irons, roller bearings, etc. A machine shop is also operated.

Things continue to hum with the plant of the Independent Brass Works, where Manager Rademaker is employing about as large a force as can conveniently work in the little shop, which has become considerably crowded for floor space.

The Hart Manufacturing Company, Louisville, is working on numerous Government orders for metal work of one kind or another, including field ovens and specialties.

It is stated that the Standard Sanitary Manufacturing Company, when in full swing on its new contract for manufacturing shells for the Government, will be employing more than 3,500 men at the local plant, which makes brass plumbing goods, enameled ware, and other material.

The Louisville Fire Brick Works, which manufactures fire brick, used in large metal working plants for heating purposes, and also for lining ship fire boxes, has suffered extremely from the influenza epidemic which closed its plant and mines in Carter County, Ky. The local plant has managed to keep going on a good capacity basis.—O. V. N. S.

PHILADELPHIA, PA.

NOVEMBER 11, 1918.

The metal trades of this city went "over the top" in the Fourth Liberty Loan campaign. Subscriptions were large, both from firms and employes. The metal trades had been assigned $800,000 as their quota, but they nearly tripled this amount, their total subscriptions being $2,222,400. Among the large subscribers were: E. J. Lavino, $500,000; E. J. Lavino & Co., $250,000; Girard Iron and Metal Company, $51,500; Enterprise Manufacturing Company, $105,000; Swind Machinery Company, $32,000; Merchant & Evans Company, $150,000; American Manganese Manufacturing Company, $20,000; Hero Manufacturing Company, $125,000; and employes, $100,000; General Smelting Company, $250,000; American Phosphorus Company, $50,000; Ajax Metal Company, $106,000; David Lupton's Sons, $115,000; W. E. Shipley Machinery Company, $22,000; Fayette R. Plumb, Inc., and employes, $92,000; White & Brother, Inc., $25,000; J. H. Jully Company, $21,000; N. and G. Taylor Company, Inc., $25,850; General Magnesite and Magnesia Company, $25,300; Nathan Trotter & Co., $10,000; and Cambria Mining and Manufacturing Company, $15,000.

The Hero Manufacturing Company, Adams and Gaul streets, manufacturers of brass bronze and aluminum products, are preparing to erect extensions to three buildings at their plant, each to be 100 by 250 feet.

On October 23, the American Metal Company, 11 Catharine street, entered suit in the Municipal Court against the Henry K. Fort Company, 2227 North American street, to recover $469, alleged to be due for brass sold and delivered.

Word that the wooden ship *Ethel*, carrying a cargo of 1,100 tons of manganese ore, had been lost off Cuba was received by E. E. Marshall, president of the American Manganese Manufacturing Company, Bullitt building, this city, on October 30. The vessel was bound from Santiago to Norfolk. It has not been definitely ascertained as to whether the *Ethel* was sunk by a submarine, mine or accident. The crew have been reported as saved.

Blair, Campbell & McLean, of this city, have been granted a charter of incorporation in Delaware, to manufacture brass castings, copper specialties, etc. G. H. Elmore and J. C. Lawrence are among the incorporators. The capital stock is $500,000.

Plans are being prepared for Fayette R. Plumb, Inc., Tucker and James streets, Bridesburg, Pa., for an alteration and addition to their plant to cost approximately $10,000. The firm manufactures edge tools and holds a large Government contract.

Distribution of lead is being made where required for urgent war needs. Non-essentials find it virtually impossible to obtain supplies. Prices are reported unchanged. Production is said to be steadily maintained at last month's rate.

Demand for spelter remains light, with the market easier. Buyers are making virtually no efforts to secure supplies for their 1919 needs.

The action of the Government in continuing the prevailing price of copper in force after October 31, met with little comment among the local trade. The action was made at the recommendation of the War Industries Board and approved by President Wilson, October 28. The old price of twenty-six cents a pound will continue in force until January 1. Handlers of copper here expected that the old price would be continued, basing their opinions on current reports. Government business predominates in this metal, and those requiring copper for non-essential work find their supplies cut off. There is a shortage noted in spots for Government account.

Clarence White, of White & Bro., Inc., the prominent metal firm here, is receiving congratulations from friends. It was learned that he was the father of a new baby girl. Mr. White is serving with the United States in the reclamation and conservation division of the Quartermaster's Department.

Trading in pig tin is dull. The trade here reports that there is little likelihood of an improvement in conditions until some announcement is made by the Government relative to what action they will take on this metal. On October 15, the trade rendered the Government questionnaires, and, it is understood here, that these are being carefully gone over. Much uncertainty prevails as to whether a price will be fixed on tin. The trade awaits some announcement by the Government on the tin question and until something definite is done trading is expected to remain at a low ebb. A committee of importers, the trade say, is drawing up a protest in an effort to afford protection to their business after the war, and it is expected that a meeting will soon be called for those interested to pass upon the protest. Prices are reported as unchanged.

Labor conditions are still causing considerable concern to metal trades here. While female help continues to be substituted for male, the labor situation is still acute and is felt in war industries as well as in non-essential plants.

Plating trades who are able to secure war work are busy, but they are seriously handicapped by lack of competent labor. The continued restrictions against new buildings, except for war work, is playing havoc with plating firms, who formerly found the largest proportion of their business with concerns manufacturing gas and electric fixtures. Further curtailment of the stove and range output, by order of the War Industries Board and the restrictions on the use of nickel in their products, has reduced work in some plating plants to practically nothing. Unless war work can be obtained by some shops, particularly the small ones, some plants will be obliged to suspend operations.—F. W. C.

TRENTON, N. J.

NOVEMBER 11, 1918.

That the metal industries of Trenton again displayed their patriotism is shown in the fact that more than $200,000 was subscribed for the Fourth Liberty Loan. The Trenton concerns went "over the top" on all four loans, and this time both the manufacturers and employes stretched a point to give all they could to make the Fourth Loan a record-breaker from their standpoint.

The Jordan L. Mott Company, one of the biggest concerns of its kind in the country, headed the list, with subscriptions amounting to $100,000. The Trenton Brass & Machine Company bought $30,000 worth of the bonds and the employes of the works subscribed $11,300. The Ingersoll-Trenton Watch Company had subscriptions amounting to $13,000. The Mercer Automobile Company employes and officials bought $16,150 worth, while William T. White, president of the concern, subscribed $250. The Westinghouse Lamp Company subscribed $11,200, while the McFarland Foundry and Machine Company bought $2,150 worth, and the Billingham Brass & Machine Company, $1,250. The Skillman Hardware Manufacturing Company was a liberal subscriber and its employes purchased bonds individually outside the plant. The employes of the John A. Roebling's Sons Company purchased $600,000 worth, this including the copper and bronze departments. The Trenton Smelting and Refining Company and other concerns were also liberal buyers.

The last draft has caused such a serious drain on the manpower of the various metal plants that one Trenton concern will appeal to the Government to allow its employes to continue working and not compel any more of the workers to enter the army. Practically all the Trenton plants are working on Government orders, thus placing them in the essential class; despite this fact, many of the employes were called in the last draft. William G. Wherry, president of the Skillman Hardware Manufacturing Company, said to a representative of THE METAL INDUSTRY: "We are placed in a serious fix because of the taking of men into the army and we have difficulty in keeping a force large enough to continue operating all departments. If any more of my hands are called, I will have to appeal to the Government. We are doing important Government work and must have the men to turn out the orders."

Other metal concerns will follow the same course if the help becomes any scarcer. The Skillman company recently was compelled to place a number of girls and young women at work to fill the places of the men. They are being paid good wages and are promised steady work. There is also a demand for lock fitters at the plant. The American Standard Metal Products Corporation, with plants at Bordentown and Paulsboro, have hired many young women for all the departments and some are working on heavy machinery.

The influenza and pneumonia epidemic resulted in a serious delay to the metal industries of Trenton during the past month and caused one plant to shut down for several days. Business was suspended for a time at the plant of the Co-Operative Safe-

guarding Company on East State street. The concern, which manufactures brass safeguards, employs seventeen hands, and fifteen of that number were taken ill with influenza. The company is very busy and is working on a big Government contract. The Trenton Brass & Machine Company, Billingham Brass & Machine Company, Skillman Hardware Manufacturing Company, the Jonathan Bartley Crucible Company, Ingersoll-Trenton Watch Company, Trenton Smelting and Refining Company, Jordan L. Mott Company and other metal concerns also felt the great shortage through its many employes being ill.

The plant of the Skillman Hardware Manufacturing Company was damaged by fire recently when a spark from a cupola ignited the roof of the foundry. The roof of the building was destroyed and the firemen were compelled to chop holes in the structure to reach the flames. Considerable stock in an adjoining building was damaged by smoke and water. Max Movshovitz, owner of the M. M. S. Metal Company, whose plant was badly damaged by fire recently, has taken out a permit for the erection of a one-story brick addition to adjoin the works on Fair street. The structure will cost $2,000. The damaged building has been put into shape again and work resumed. The International Copper Company, Frelinghuysen avenue, Newark, will build an addition to the boiler house—to cost $1,000.

The officials of the American Standard Metallic Products Corporation announce that they will begin the construction of twenty large dwelling houses for the accommodation of its employes, who have been unable to secure suitable houses for their help. The receiver of the Selah Manufacturing Company, manufacturers of metal goods, Newark, has been discharged by Chancellor Lane.—C. A. L.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Pangborn Corporation, Hagerstown, Md., and employes subscribed to the amount of $52,100 for the Fourth Liberty Loan, $27,100 being subscribed for by the employes and $25,000 by the company.

Franklin Williams, Newark, N. J., is having plans prepared for a one-story foundry, 50 by 150 feet, to be erected at Jefferson and Oliver streets and which will be devoted to light foundry work.

The Milwaukee Brass Manufacturing Company, 249-251 Lapham street, Milwaukee, Wis., states that there is no truth in the report that it is making alterations to its plant and installing machinery to increase capacity.

The manufacture of brass and nickel-plated pens will be discontinued shortly by a ruling of the War Industries Board. No new types of pens are to be produced during the war. The variety of existing styles also is to be materially reduced.

The Hughes Manufacturing Company, Rome, N. Y., announces that it is about to install equipment for a plating and japanning plant to handle about 200,000 pounds of its products per year. The company manufactures buttons, hooks and eyes, snap fasteners, etc.

The Government is now running the former **George Benda plant,** Boonton, N. J., devoted to the manufacture of bronze powders, etc., recently taken over by A. Mitchell Palmer, Alien Property Custodian. It is understood that such operation has proved so successful that the sale of the property, as planned, has been postponed indefinitely.

The Kilborn-Sauer Company, of Fairfield, Conn., announces that it is in the market for metal spinning, drawing and stamping of such articles as automobile lamps, mirrors, etc. The company also states that its plant is located in the heart of Fairfield, a very short distance from the freight and express stations, thus having excellent shipping facilities.

The Cleveland Brass and Copper Mills Company, Cleveland, Ohio, has completed the erection of the one story 77 by 139 feet factory which the company was erecting on Babbitt Road. The erection of another building 80 by 120 feet of brick construction has already been started and when completed will be used for the handling of metal products right from the casting shop and will be equipped with machinery for sawing gates off billets, overhauling machines and slab millers. The estimated cost of this new building is $35,000.

Directors of the **American Metal Company,** New York, have called a meeting of stockholders to be held November 22 to act on a proposal to dissolve the company. Shares owned by enemy aliens, comprising about 49 per cent. of the stock of the company, were taken by the government in January, 1918. Five directors were appointed to represent the shares. Directors appointed to represent the shares taken over constituted one-third only of the entire directorate, and it is stated officially that no cause was discovered for changes in executive control.

The Anaconda Copper Mining Company of Great Falls, Montana, reports that in its rolling mills department it is operating at present only a copper plant. The wire mill is prepared to make all standard sizes of hot-rolled copper rods from ¼ of an inch to one inch. In the wire drawing department they have equipment to make all sizes of bare wire from 4/0 to No. 16 inclusive. The company also states that it has complete equipment of stranding machinery and can make almost any commercial combination. At present the Anaconda Company is engaged in manufacturing several very large orders, one order requiring between six and seven million pounds of copper for the Chicago, Milwaukee & St. Paul Railways' electrification from Seattle, Wash., east.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture brass, bronze and aluminum castings. Lincoln Way Brass Foundry Company, South Bend, Ind. Capital $18,000. Incorporators: Sherman P. Stults, Charles Heckathorn, Henry Johnson.

Without any change in policy, officers or personnel, the Charter of the Speakman Supply and Pipe Company, Wilmington, Del., has been amended and the firm name changed to the **Speakman Company.**

The firm of Moller & Schumann Company, Brooklyn, N. Y., manufacturers of Hilo varnishes, enamels, japans, etc., has changed its name to the **Hilo Varnish Corporation.** The personnel of the company remains unchanged.

REMOVALS

The main office of the **Hoevel Manufacturing Corporation,** manufacturers of sand blast machines, has been moved from 50 Church street to the company's factory at 154 Ogden avenue, Jersey City, N. J.

Ricketts and Company, Incorporated, formerly of 80 Maiden Lane, announce that, in order to meet the requirements of their increased business and their enlarged staff, they have moved their offices to 280 Madison avenue, New York. By associating with them Charles E. Wagstaffe Bateson, E. M., M. A., and Dr. M. L. Hamlin, M. A., Ph. D., and by securing the services of T. A. Shegog, A. R. C. S. I., F. I. C., formerly Assistant Professor of Chemistry and Metallurgy at the Royal College of Science, Dublin, and Professor of Chemistry and Metallurgy for the County of Monmouth, they have paced themselves in a position not only to carry on their mining and metallurgical consulting business on an enlarged scale, but to handle the most varied organic and inorganic manufacturing problems and related chemical work.

PRINTED MATTER

Carrying Systems.—The Richards-Wilcox Manufacturing Company, Aurora, Ill., has issued a folder in the interest of their Over-Way carrying systems. This folder consists of sixteen pages and is called "A Yard of Pictures," showing actual installations of Over-Way carrying systems in various plants, shops and institutions of every description.

Oakite.—The bright little news organ of the Oakley Chemical Company, New York, has made its appearance for November, and as usual is filled up with a lot of interesting matter relating to the uses of products manufactured by this company and letters from representatives giving accounts of their work in the field.

Magnetic Separator.—A machine built by J. W. Paxson Company, of Philadelphia, Pa., is illustrated and described in a new bulletin just issued. It is stated by the company that there are over 1,500 of these machines in use and it is Paxson made. The magnets are energized, the brushes are made and the whole machine is constructed and assembled in the Paxson shops. Copies of the booklet may be had upon request.

Grinding Wheels.—The Economical Use of Grinding Wheels is an eighteen-page booklet just published by the Webster and Perks Tool Company, Springfield, Ohio. This booklet is devoted to the long line of ball and plain bearing grinding machinery that is turned out by the above company for every grinding need. The booklet reproduces a complete and interesting article on "Grinding Wheels, What Kind to Use and How They Should Be Operated."

Platinum Melters.—The Jewelers Technical Advice Company, New York, has issued a folder giving illustrations and details relating to the Hoke-Phoenix platinum melters. These melters are recommended particularly for use in refining platinum and gold filings and clippings and also for the soldering, welding and melting of platinum and other metals. The folder contains other information of value to the metal melter and finisher and copies of it may be obtained upon request.

Cleaners.—James H. Rhodes & Company, Chicago, Ill., has issued a booklet on their various cleaners—Colossus Solvene, Murcom, Metalite and Chemico. It is stated by the company that the war service record of these cleaners is already imposing. Colossus Murcom is the standard cleaning material in the largest plating and munitions making plants in America, while Colossus Solvene is similar in character, but is used to remove oil, grease and abrasives from machined parts such as typewriter frames, automobile bumper bars, motor parts, gun mounts, shells, gun parts, etc. Copies of this booklet may be had upon request.

Oil Fuel.—A handbook on the efficiency and the use of oil fuel containing eighty-six pages has been issued by the Department of the Interior, Bureau of Mines, Washington, D. C. This handbook has been prepared by J. M. Wadsworth, and is designed for the use of boiler plant and locomotive engineers. The handbook has been compiled from the investigations of the Bureau of Mines and from information furnished by leading authorities in co-operation with the United States Fuel Administration. There are a number of illustrations in the book, and these with the text articles and tables make the matter contained therein extremely valuable to the fuel engineers.

White Enamels, Air Drying and Baking.—Bulletin No. 3 issued by the Hilo Varnish Corporation, 1-11 Gerry street, Brooklyn, N. Y., manufacturers of "Hilo" enamels, japans and varnishes, describes the company's line of white enamels for all purposes. Their products include primers for preparing surfaces for enameling, fillers for smoothing out rough surfaces and imperfections in castings; special enamels for first coating and other products for use on every kind of article such as machinery, tinware, toys, lamp shades, reflectors, buttons, metal beds, radiators, hot air registers, etc. The Hilo Varnish Corporation offers the services of their Hilo "Better-the-Finish" Laboratory to co-operate with manufacturers in determining the finishes best suited for specific purposes, on any kind of metal, wood, or other surfaces.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL STOCKS MARKET QUOTATIONS

New York, November 11, 1918.

	Par	Bid	Asked
Aluminum Company of America	$100	$500	$600
American Brass	100	204	210
American Hardware Corp.	100	132	137
Bristol Brass	25	38	42
Canadian Car & Foundry, com.	100	28	32
Canadian Car & Foundry, pfd.	100	81	88
Eagle Lock	25	78	85
International Silver, com.	100	40	50
International Silver, pfd.	100	70	80
New Jersey Zinc.	100	234	239
Rome Brass & Copper	100	300	350
Scovill Manufacturing	100	385	405
Standard Screw, com.	100	265	275
Standard Screw, "A" pfd.	100	103	—
Yale & Towne Mfg. Co.	100	200	210

Corrected by J. K. Rice, Jr., & Co., 36 Wall street, New York.

METAL MARKET REVIEW

Written for The Metal Industry by W. T. Partridge.

November 11, 1918.

COPPER.

Shortage of labor due to the prevailing epidemic of influenza was the main factor interfering with production of copper in October occasioning some uneasiness as to whether supplies could be kept up to war requirements. Notwithstanding some decrease in output of both crude and refined copper, however, statisticians' estimates for the month, agree that the falling off in exports during the past few months combined with increased importations of foreign material during the same period, will offset in a measure at least sufficient, to prevent any actual shortage of metal. Strict conservation of copper is practised by all consumers.

The meeting scheduled for late in October, to consider revision of the 26c. per pound price—which was established July 2, to be effective until November 1—was countermanded by Mr. Yeatman of the War Industries Board at the eleventh hour. Later, announcement was made that President Wilson had approved the continuation of the existing price over the remainder of the year.

Exports of copper this year, to September 1—exclusive of shipments to Canada during August—were 234,668 tons as compared with total shipments in 1917 of 493,256 tons.

Importations of copper, to September 1, this year (ores, matte and regulus reduced to fine copper) were 171,000 tons as compared with total importations in 1917 amounting to 242,000 tons, according to U. S. official returns.

TIN.

With the passing of the tin market under complete control of the International Allied Tin Executive, during October, but with full details as to the regulation and administration, lacking, business was more or less uncertain throughout the entire period

and transactions necessarily were small. Details given out, place all importation and distribution of pig tin under control of the U. S. Steel Products Co. Regulations concerning jobbers, dealers and brokers are not yet issued, but importers are practically out of business for the duration of the present control. Various meetings of these interests have been held and an association formed to guard their interest and to insure continuation of business when peace is established.

Prices showed a steady decline both at home and abroad. No Straits metal was offered and no quotations were given. Spot Banca, obtainable early in the month at 82.50c. per lb. could be bought in the closing days for 77.50c.; 99 per cent. tin declined from 80.50c. to 77c. per lb. Other varieties suffered like declines ranging from 3.00c. to 4.00c. per lb.

Arrivals at Atlantic ports were 600 tons; at Pacific ports, 3,075 tons, a total of 3,675 tons, as compared with 5,114 tons at all ports during September.

Reductions from Bolivian ores in the U. S. showed a further decline in September, the amount being only 410 tons. Total reductions for first nine months this year were 8,763 tons, as compared with 4,849 tons during the twelve months of 1917, according to New York Metal Exchange reports.

SPELTER.

During first half of October, the spelter market continued quiet with prices for prompt declining from 9.05c. E. St. Louis, 9.40c. New York, at the beginning to 8.60c. E. St. Louis, 8.95c. New York by the end of first fortnight. With the coming into the market of heavy Government requirements, 8,000 tons grade C for delivery over the next two months and 1,000 tons needed by the Navy, the decline was arrested and an improvement noted that continued to 8.90c. E. St. Louis, 9.25c. New York during the succeeding week. Thereafter, with the weekly statistics showing but slight decrease in stocks, prices again receded to 8.60c. E. St. Louis, 8.95c. New York, but again made a recovery to 8.75c. E. St. Louis, 9.10c. New York at the close. Brass special under very light demand recovered to its normal premium, ⅛c. to ¼c. over the prices of prime Western.

Exports of spelter from domestic ores during first eight months 1918 were 44,089 tons; from foreign ores during same period were 12,122 tons.

LEAD.

Strict control of the lead market continued throughout October with unchanged prices, 7.75c. per lb. E. St. Louis, 8.05c. New York. While supplies have not increased, the judicious management and untiring efforts of the Lead Producers' Committee have been able, even with the acute shortage of metal, to meet all Government war requirements, which are still enormously heavy. Jobbers' prices for prompt ex-store New York, were maintained unaltered at 8.55c. per lb. New York, while for less than one ton lots 8.80c. per lb. was paid here. Lead ore very firm at $100 per ton.

Exports of lead from domestic material over first eight months were 46,312 tons; from foreign material in bond, 19,416 tons.

ANTIMONY.

The demand for antimony in October was light outside of the Government order for 3,000 tons which was placed late in the month. Prices which opened at 14.00@14.12½c. per lb. for wholesale lots and at 14.12½@14.37½c. according to size of orders for jobbing lots, gradually declined to 10.50c. for prompt metal, duty paid and also for December, January, February delivery for wholesale lots. Jobbing lots were held at the usual ⅛c. to ¼c. per lb. higher price.

Importations of antimony during first seven months 1918 were 6,319 tons, as compared with 10,288 tons for corresponding months 1917. July, 1918, arrivals were 1,125 tons.

ALUMINUM.

Further conservation of aluminum supplies became necessary in October, resulting in the curtailment of the manufacture of various articles, such as oil and gasoline stoves, ovens and heaters, through the elimination of 466 existing styles and sizes. Representatives of the secondary aluminum trade, through suggestions from the War Industries Board, formed themselves into a War Service Association to work in close co-operation with the Government in conserving aluminum for war requirements. Prices remain fixed at 33c. per pound, as the maximum base for ingots, 98 to 99 per cent. pure, f. o. b. United States producing plants, until March 1, 1919.

Exports of aluminum from the port of New York in August amounted to 912 tons, according to New York Metal Exchange figures.

SILVER.

The price of silver in the New York market throughout October was unchanged at 1.01⅛. Exports of silver in September amounted to only $10,300,000, a very heavy falling off as compared with August exportations of $23,000,000, while importations were $7,170,000, as compared with $7,256,000 in August. Total exportations over first nine months of the year were $165,000,000, while importations for same period were nearly $55,000,000.

PLATINUM.

The platinum shortage continues acute, making not only conservation of supplies imperative but the use of substitutes necessary wherever possible. The Government price remains fixed at $105 per ounce.

QUICKSILVER.

The decline in production of quicksilver during first half 1918, estimated to have been 401 flasks of 75 lbs. each, occasioned concern as Government's requirements call for at least 36,000 flasks this year. Shortage of labor, higher wages and depletion of known ore bodies are the reasons given. The Government price remains $105 per flask for pure, $100 per flask for recoveries. To other consumers, $125 per flask was unchanged during the month.

OLD METALS.

The old metals market in October was affected by the labor shortage and influenza to a moderate extent only. Peace prospects had a more potent influence and a falling off in demand was apparent. Prices declined ¼c. to 3½c. per lb. throughout the entire list, clean red car boxes suffering the most, in a decline from 23c. to 19.50c. per lb. The one item advanced was old cast aluminum, up from 25.50c. to 26c. per lb.

WATERBURY AVERAGE

Lake Copper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50. March, 23.50. April, 23.50. May, 23.50. June, 23.50. July, 26.00 August, 26.00. September, 26.00. October, 26.00.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60. March, 9.40. April, 8.50. May, 8.95. June, 9.50. July, 10.30. August, 10.45. September, 11.20. October, 10.60.

OCTOBER MOVEMENT IN METALS

Copper:	Highest	Lowest	Average
Lake	*26.00	*26.00	*26.00
Electrolytic	*26.00	*26.00	*26.00
Casting	*26.00	*26.00	*26.00
‡Tin	Market nominal; no metal offering		
Lead	8.05	8.05	8.05
Spelter (brass special)	9.20	8.85	‡8.60
Antimony	14.12½	11.75	13.44
Aluminum	†33.10	†33.10	†33.10
Quicksilver (per flask)	$125.00	$125.00	$125.00
Silver (cents per ounce)	101⅛	101⅛	101⅛

*Government price. †Government price for carload lots. ‡No quotations from October 15 to 25, inclusive; market nominal, no metal offering.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

Metal Prices, November 11, 1918

NEW METALS

COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.		
Electrolytic, carload lots, nom.	Government price.	26
Lake, carload lots, nominal...	Government price.	26
Casting, carload lots, nominal		26
TIN—Duty Free.		
Straits of Malacca, carload lots		none offered
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots		8.05
SPELTER—Duty 15%.		
Brass Special		9.125
Prime Western, carload lots		9.00
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.		
Small lots, f. o. b. factory		....
100-lb., f. o. b. factory		....
Ton lots, f. o. b. factory	Government price.	33.20
ANTIMONY—Duty 10%.		
Cookson's, Hallet's or American		Nominal
Chinese, Japanese, Wah Chang WCC, brand spot		10½
NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.		
Shot or Ingots		40 to 43c.
ELECTROLYTIC—5 cents per pound extra.		
MANGANESE METAL		Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)		$1.90
BISMUTH—Duty free		3.50
CADIUM—Duty free	nominal	1.75
CHROMIUM METAL—Duty free	nominal	
COBALT—97% pure		3.00
QUICKSILVER—Duty 10% per flask of 75 pounds		$125.00
PLATINUM—Duty free, per ounce		105.00
SILVER—Government assay—Duty free, per ounce		1.01⅛
GOLD—Duty free, per ounce		20.67

INGOT METALS

Silicon, Copper, 20%	according to quantity	49	to54
Phosphor Copper, guaranteed 15%	" "	55½	to62½
Phosphor Copper, guaranteed 10%	" "	49	to55
Manganese Copper, 30%, 2% Iron	" "	65	to71
Phosphor Tin, guaranteed, 5%	" "	1.01	to1.06
Phosphor Tin, no guarantee	" "	1.00	to1.05
Brass Ingot, Yellow	" "	19½	to19⅞
Brass Ingot, Red	" "	27	to27⅜
Bronze Ingot	" "	27½	to29½
Parsons Manganese Bronze Ingots	" "	35½	to38
Manganese Bronze Castings	" "	40	to50
Manganese Bronze Ingots	" "	26	to30
Manganese Bronze Forgings	" "	46	to55
Phosphor Bronze	" "	24	to30
Casting Aluminum Alloys	" "	33	to38

OLD METALS

Buying Prices.	Selling Prices.
24.00 Heavy Cut Copper	25.50
23.00 Copper Wire	25.00
21.00 Light Copper	23.00
23.00 Heavy Mach. Comp	25.50
14.50 Heavy Brass	16.50
11.00 Light Brass	13.50
14.25 No. 1 Yellow Brass Turning	14.25
21.50 to 22.50 No. 1 Comp. Turnings	23.00 to 25.00
7.00 Heavy Lead	7.25
5.25 Zinc Scrap	5.70
10.00 to 13.00 Scrap Aluminum Turnings	11.00 to 14.00
19.00 to 21.50 Scrap Aluminum, cast alloyed	21.00 to 23.00
26.00 to 28.00 Scrap Aluminum, sheet (new)	28.00 to 30.00
55.00 No. 1 Pewter	60.00
22.00 to 23.00 Old Nickel anodes	25.00 to 26.00
30.00 to 32.00 Old Nickel	34.00 to 36.00

Prices of Copper Sheet

Since the September number of THE METAL INDUSTRY was issued the War Industries Board has assumed control of the distribution of the output of this country's brass and copper mills. In view of this there is no longer what may be termed an open market and all published and quoted prices have been withdrawn. The matter of price on future business will be subject to negotiation between buyer and seller when the War Industries Board has issued permit to manufacture the particular lot of material required.

In view of this it is advisable for us to omit printing prices on such items as are covered by the orders of the War Industries Board until such a time as normal conditions again prevail in this line of business.

Metal Prices, November 11, 1918

DUE TO THE ASSUMPTION OF THE DISTRIBUTION OF BRASS AND COPPER BY THE WAR INDUSTRIES BOARD, ALL PUBLISHED AND QUOTED PRICES FOR THESE METALS HAVE BEEN WITHDRAWN FOR THE DURATION OF THE WAR.

SOME STATISTICS ABOUT TIN

A recent bulletin of the United States Geological Survey prepared by Adolph Knopf gives the following information about Tin.

The metallic tin estimated as recoverable from ore of domestic origin mined in 1917 was 90 short tons, a decrease of 50 short tons from the output of 1916. As in recent years, the bulk of the tin-bearing concentrate was obtained by dredges in Alaska, whose working season is limited by climatic conditions to less than 100 days a year. Part of the concentrate was shipped from Seattle to Singapore to be smelted and part was sent to the smelter at Perth Amboy, N. J.

The tin imported in 1917 as metal and metal in concentrate reached the record quantity of 77,866 short tons, or 57 per cent of the world's output for the year. The metal imported and entered for consumption was 72,166 short tons, and the domestic smelter output was 6,000 tons. The total supply of new tin available for consumption was, therefore, 78,000 tons. It is estimated that an additional 17,500 tons of tin became available by recovery from drosses and waste metals.

The unprecedentedly high prices of tin that prevailed during the latter part of 1917 and that still prevail have stimulated interest in the deposits of tin ore in the United States. The known deposits are unfortunately small in number, and but few of these are commercially promising. Governmental stimulation, therefore, is not likely to add significantly to the domestic supply of tin. It is not probable that the country will achieve in 1918 an output much in excess of 200 tons of metallic tin from ores of domestic origin. The largest amount heretofore produced in any one year was 140 tons, or 0.2 per cent of the imports for that year.

The total quantity of tin produced from domestic ore in the United States, exclusive of Alaska, since the beginning of tin mining is 300 tons. Of this output the largest single item is the 135 tons produced in 1891 and 1892 by the Cajalco mine, in southern California, at a time when tin was at one-fourth its present price.

SMELTING

During 1917 the American Smelting & Refining Co.'s plant at Perth Amboy, N. J., produced 6,065 short tons of tin,[1] almost wholly from Bolivian concentrate. At the end of the year the plant was operating at the rate of 10,000 tons of tin a year and will probably produce 14,000 tons in 1918.

The Williams Harvey Corporation endeavored to expedite the completion of its tin-smelting plant, which is being built on Jamaica Bay, Brooklyn, N. Y., but was seriously hindered by delay in the receipt of the necessary material. This plant also will smelt Bolivian concentrates. It is now expected that the plant will be ready for operation in July, 1918, and the estimated capacity is 10 tons of tin a day. A one-third interest in the corporation has been sold to Simon I. Patiño, owner of the Salvadora and Huanuni tin mines in Bolivia, thus insuring an adequate supply of concentrate.

During 1917 somewhat less than one-fourth of the Bolivian exports of concentrate were shipped to the United States to be smelted and the remaining three-fourths were shipped to England for treatment. Manifestly it is an uneconomical use of shipping to transport this large quantity of concentrate to England to be smelted and then to ship the tin, or the equivalent in metal smelted from other concentrate, back to the United States, which is by far the world's largest consumer of tin.

Electric smelting was attempted at La Paz, Bolivia, in 1917, and 70 short tons of metal was produced, but many technical difficulties have hampered this pioneer enterprise.

The recently completed smelting plant at Arica, Chile, began operations in February, 1918, with a daily capacity of 15 tons of pig tin, and is expected to attain shortly a capacity of 30 tons. This plant is owned by the Compañia chilena de fundición de estaño (Chilean Tin Smelting Co.), a subsidiary of the Llallagua Tin Co., whose mines, 42 miles southeast of Machacamarca, Bolivia, supply the concentrate that is smelted.

Before the war a large proportion of the Bolivian concentrate went to Germany to be smelted. In 1912 Germany imported 17,961 metric tons from Bolivia and smelted 15,853 metric tons. In 1913 Germany imported 18,652 metric tons of tin concentrate, of which 16,699 tons came from Bolivia.

World's Output of Metallic Tin, 1913-1917, in Short Tons.
[Recoverable metal in ore and concentrate.]

	1913	1914	1915	1916	1917 *a*
Federated Malay States	56,140	54,930	52,380	49,130	44,400
Br. Protected Malay States	*a* 2,000	*a* 3,000	4,600	4,900	5,000
Bolivia *b*	29,500	24,600	24,100	23,500	29,300
Banca *c*	15,800	15,400	14,230	14,000	14,000
Billiton and Singkep *c*	5,290	5,770	6,490	5,500	5,500
China *d*	9,250	7,950	8,820	8,410	9,000
Siam	7,000	7,600	8,700	9,400	9,400
Nigeria	3,250	5,060	5,100	5,680	6,000
Australia	8,320	5,910	6,080	5,980	6,000
Cornwall	5,920	5,660	5,560	5,260	4,600
Union of South Africa	2,260	2,200	2,260	2,100	2,000
Other countries	1,500	1,500	1,500	1,500	2,000
	146,230	139,580	140,130	135,360	137,200
Total in metric tons	132,700	126,600	126,800	122,800	124,500

a Estimate.

b Commerce Reports, 1916, p. 973. The figures given there relate to exports of concentrate. The recoverable tin content of the concentrate is here computed on the basis of 60 per cent, which is undoubtedly somewhat low, especially for the exports since 1914. The output for 1917 is computed on the basis of 61 per cent of recoverable tin.

c. The official statistics of the Dutch East Indies are given for fiscal years; they have been here estimated for calendar years by summing the half-amounts of two consecutive fiscal years.

d Exports from all ports (Ricard and Freiwald, Statistics of tin, Feb. 28, 1918).

Tin Imported and Entered for Consumption in the United States, 1906-1917.*a*

Year.	Quantity (short tons).	Value.	Year	Quantity (short tons).	Value.
1906	50,477	$37,447,315	1912	58,016	$50,372,478
1907	41,257	32,074,263	1913	52,329	46,927,213
1908	41,267	23,923,560	1914	47,530	32,881,619
1909	47,662	27,558,546	1915	57,792	38,736,909
1910	52,528	33,913,255	1916	69,035	51,802,232
1911	53,527	43,346,394	1917	72,166	63,860,340

a Compiled from the records of the Bureau of Foreign and Domestic Commerce.

Tin Ore Imported into the United States, 1916-17.

Year.	Quantity (short tons).	Value.
1916	9,304	$4,036,821
1917	9,054	4,743,099

[1] Information from H. G. Ferguson, of the U. S. Geological Survey.

Metal Prices, November 11, 1918

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 15c. basis, less 8%
Casks, jobbers' prices.....17c.
Open casks, jobbers' prices.....17½c.

The above mill prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments.

ALUMINUM SHEET, ROD AND WIRE

Sheet Aluminum, outside market contract base price, 42.40c. per pound.

FLAT SHEET

Gauge		Price in Cents per Lb. 1 Ton Lots	15 Ton Lots	50 Ton Lots
Nos. 18 and heavier....	3" to 60"	42.40	42.20	42.00
Nos. 19 and 20.....	3" to 60"	43.50	43.30	43.10
Nos. 21 to 24, incl...	3" to 30"	45.80	45.60	45.40
	30" to 48"	48.00	47.80	47.60
	48" to 60"	51.40	51.20	51.00
Nos. 25 and 26.....	3" to 30"	49.20	49.00	48.80
	30" to 48"	51.40	51.20	51,00
No. 27.....	3" to 30"	50.30	50.10	49.90
	30" to 48"	53.70	53.50	53.30
No. 28.....	3" to 30"	52.50	52.30	52.10
	30" to 48"	55.90	55.70	55.50
No. 29.....	3" to 30"	55.90	55.70	55.50
	30" to 48"	60.40	60.20	60.00
No. 30.....	3" to 30"	58.20	58.00	57.80

ROD.

B. & S. Gauge.
¼" to 1" Advancing by 32nds
1" to 2⅝" " " 16ths } 98% rolled, 43.10 cents per lb.
2⅝" to 3½" " " 8ths

⅜" to ¼", 98% rolled and drawn.....48.80 cents per lb.

WIRE.

Definition: Round—less than ⅜" diameter. Other shapes—less than ⅜" greatest diameter.

B. & S. Gauge.	Spools.	Price in Cents Per Lb. On Spools.	In Coils.
Nos. 2 to 10, inclusive.....	50 lb.	$.465	$.437
Nos. 11 and 12.....	50 lb.	.499	.465
Nos. 13 and 14.....	35 lb.	.533	.493
Nos. 15 and 16.....	20 lb.	.611	.549
Nos. 17 and 18.....	20 lb.	.689	.606
Nos. 19 and 20.....	10 lb.	.714	.718
No. 21.....	10 lb.	.815	.803
No. 22.....	10 lb.	1.050	.915
No. 23.....	10 lb.	1.185	1.028
No. 24.....	5 or 2 lb.	1.421	....
No. 25.....	5 or 2 lb.	1.646	....
No. 26.....	5 or 2 lb.	1.928	....
No. 27.....	1 lb.	2.321	....
No. 28.....	1 lb.	2.771	....
No. 29.....	½ lb.	3.840	....
No. 30.....	⅓ lb.	5.021	....

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over at N. Y. tin price, 100 lbs. or more, 5c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—No quotation.

PLATERS METALS

Nickel silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from $1.03 to $1.05 per Troy ounce, depending upon quantity.

NICKEL ANODES

85 to 87% purity..... .55c. per lb.
90 to 92% " ..... .57½c. " "
95 to 97% " ..... .60c. " "

UNITED WAR WORK CAMPAIGN

CLEAN MEN FOR THE WORK OF THE WORLD

The war is not over. Our industries have just contributed to a huge Liberty Loan to help bring that war to a successful conclusion. We have invested our money in equipment for our soldiers. We are now asked to give our money for the upbuilding of the morale of that Army. No war has ever been fought with as clean an army as America has sent to the Old World. General Pershing has said that every hut adds ten men to a quota of one hundred.

The task of upholding the morale of the Army should peace be declared tomorrow is even greater than that during the war. Under the inspiration of patriotic purpose men forget their petty vices and put into their work the enthusiasm and the self-sacrificing spirit that comes from high ideals. It is human after a great crisis to let down. Should peace be declared tomorrow it would be human for men to let down. If our men and boys are to come back fit for the work of the world which will face them on their return, if they are to take a vital part in the tremendous task of reconstruction which faces us in this country after the war, they must come back clean and whole, they must come back with the same moral courage to meet the problems of commercial life that they have learned counts for so much in military life.

To state these self-evident facts is simply to state the fundamental value of pushing this campaign for United War Work to a successful conclusion. Presidents and Generals, business men and soldiers have only words of commendation for what has been accomplished. May each individual take to himself a part of the moral responsibility of the world and see that he does his part in the drive that started on November 11 and closes November 18, 1918.

Supply Prices, November 11, 1918

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg.	lb.	.08
Hydrochloric, C. P., 22 deg	lb.	.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg.	lb.	—
Nitric, 42 deg.	lb.	—
Sulphuric, 66 deg.	lb.	.08
Alcohol—		
Denatured	gal.	1.00
Alum—		
Lump	lb.	—
Powdered	lb.	—
Aluminum sulphate, iron free	lb.	.06
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Arsenic, white	lb.	.25
Argols, white, see Cream of Tartar	lb.	.80
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.10
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	.60
Carbonate	lb.	.45
Cyanide	lb.	.65
Sulphate	lb.	.12
Copperas (Iron Sulphate)	lb.	.03
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.10
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.03
Lead Acetate (Sugar of Lead)	lb.	.20
Yellow Oxide (Litharge)	lb.	.20
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate Dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.16
Salts, double bbl.	lb.	.14
Paraffin	lb.	.25
Phosphorus—Duty free, according to quality		60-80c.
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 96-98%	lb.	.50
Cyanide, 98-99½%	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	73⅝
Rosin	lb.	.10
Rouge, nickel	lb.	.45
Silver and gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	.25
Sal Soda	lb.	.03
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.6537
Soda Ash, 58%	lb.	.06
Sodium—		
Biborate, see Borax	lb.	.10
Bisulphite	lb.	.07
Cyanide	lb.	.30
Hydrate (Caustic Soda)	lb.	.07
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.12
Phosphate	lb.	.07
Silicate (Water Glass)	lb.	.08
Sulpho Cyanide	lb.	1.00
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.20
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	.60
Water Glass, see Sodium Silicate	lb.	.05
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.20
Cyanide	lb.	.50
Sulphate	lb.	.06

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$77.50
14 " 20 " 64/68 "	"	102.50
12 " 20 " 84/92 "	"	93.00
14 " 20 " 84/92 "	"	120.60
Sewed buffs per pound.		
Bleached and unbleached	"	.65
Colored	"	.55

FELT WHEELS

White Spanish— Diameter	Thickness	Price	
6 to 20 inches, inc.	½ inch or under	$4.05	per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	3.45	"
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	3.25	"
10 to 16 inches, inc.	1 inch to 3 inches, inc.	3.15	"
18 to 20 inches, inc.	1 inch to 3 inches, inc.	3.25	"
6 to 20 inches, inc.	over 3 inches	3.25	"

Grey Mexican— Diameter	Thickness	Price	
6 to 20 inches, inc.	½ inch or under	$3.95	per lb.
6 to 20 inches, inc.	⅝ inch to ⅞ inch, inc.	3.35	"
6 to 9⅞ inches, inc.	1 inch to 3 inches, inc.	3.15	"
10 to 16 inches, inc.	1 inch to 3 inches, inc.	3.05	"
18 to 20 inches, inc.	1 inch to 3 inches, inc.	3.15	"
6 to 20 inches, inc.	over 3 inches	3.15	"